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ABSTRACT

To provide information on performance and characteristics of effective and ineffective marginal personnel in the Army, a study has been made of approximately 1,500 men with experience ranging up to 20 years in four different Army MOSs. The study included a group of men with Armed Forces Qualification Test scores in the marginal range and a comparison group of men in the same jobs, but in the upper AFQT levels. This report, the third in a series, describes the bulk of the major study findings including comparisons of the performance of men in different mental categories with different amounts of job experience, comparisons of the performance of special subgroups (Negroes and Caucasians, inductees and enlistees, and men with formal and on-the-job training), an analysis and definition of acceptable performance, and a procedure for using Job Knowledge tests to screen ineffective performers. (Author)

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Performance in Four Army Jobs by Men at Different Aptitude (AFQT) Levels: 3. The Relationship of AFQT and Job Experience to Job Performance

Robert Vineberg and Elaine N. Taylor

HUMAN RESOURCES RESEARCH ORGANIZATION
300 North Washington Street • Alexandria, Virginia 22314

Approved for public release; distribution unlimited.

August 1972

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Washington, D.C. 20310

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Robert Vineberg and Elaine N. Taylor

HumRRO Division No. 3
Presidio of Monterey, California
HUMAN RESOURCES RESEARCH ORGANIZATION

Work Unit UTILITY

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The Human Resources Research Organization (HumRRO) is a nonprofit corporation established in 1969 to conduct research in the field of training and education. It is a continuation of The George Washington University Human Resources Research Office. HumRRO's general purpose is to improve human performance, particularly in organizational settings, through behavioral and social science research, development, and consultation. HumRRO's mission in work performed under contract with the Department of the Army is to conduct research in the fields of training, motivation, and leadership.

The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

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FOREWORD

Work Unit UTILITY was initiated by the Human Resources Research Organization in January 1967 as part of Project 100,000 to provide information about the Army performance and characteristics of marginal personnel, men whose scores on the Armed Forces Qualification Tests were in the low levels. The research was sponsored by the Office of the Assistant Secretary of Defense for Manpower, Department of Defense, and the Deputy Chief of Staff for Personnel, Department of the Army. Its objectives were (a) to find out how men in Mental Category IV compared with men in other mental categories in the performance of selected Army jobs, and (b) to identify factors associated with satisfactory performance in different mental category groupings—specifically, to explore the relationships among a man's background, personal characteristics, Army experiences, and their effect on his job performance.

The UTILITY research was conducted by HumRRO Division No. 3, Presidio of Monterey, California, Dr. Howard McFann, Director. Dr. Robert Vineberg was the Work Unit Leader. Members of the research team at various times have included Dr. Elaine N. Taylor, Dr. John S. Caylor, Miss Annette K. Mahikoa, Dr. S. James Goffard, Dr. Thomas G. Sticht, Dr. Joseph S. Ward, Dr. Herbert G. Gerjuoy, Mr. Donald F. Polden, and Mr. Leon E. Guyton.

Military support for the study was provided by the U.S. Army Training Center Human Research Unit. Successive Military Chiefs of the Unit during the research project were LTC David S. Marshall, LTC Robert J. Emswiler, and COL Ullrich Hermann. Enlisted men assigned to the project during the data analysis and report preparation phase included SGT Gerald G. Lynch, SP5 William Yanda, and SP4 Gregory Herr.

The extensive findings from this research are being described in a series of reports. This, the third report, describes the major study findings including comparisons of the performance of men in different mental categories with different amounts of job experience, comparisons of the performance of special subgroups (Negroes and Caucasians, Inductees and Enlistees, and Men with Formal and On-The-Job Training), an analysis and definition of acceptable performance, and a procedure for using Job Knowledge tests to screen ineffective performers.

The first report in the series *(Performance in Five Army Jobs by Men at Different Aptitude (AFQT) Levels: 1. Purpose and Design of Study*, Technical Report 70-18) describes the rationale, research design, and general chronology of research events. The second report *(Performance in Five Army Jobs by Men at Different Aptitude (AFQT) Levels: 2. Development and Description of Instruments*, Technical Report 70-20) describes the data collection instruments used in the study and their development and administration. Another report, *Effects of Aptitude (AFQT), Job Experience, and Literacy on Job Performance: Summary of HumRRO Work Units UTILITY and REALISTIC*, HumRRO Technical Report 71-1, February 1971, presents a summary of the findings of both HumRRO Work Units UTILITY and REALISTIC that contain factual information on the performance of Category IV men in four Army jobs. In addition, *Marginal Manpower: Job Capability as a Joint Function of Aptitude and Experience*, HumRRO Professional Paper 18-71, August 1971, describes research on men with marginal mental ability.

The fourth and final report in this series will describe the relationship among the three performance criteria used in the study: Job Sample tests, Job Knowledge tests and

Supervisor Ratings. An additional report, on the performance of Medical Specialists in different mental categories, had originally been planned. However, job specialization within this MOS prevented the collection of sufficient data to allow for meaningful analysis of any subsamples of men with comparable job experience; consequently, this report was dropped from the series.

HumRRO research for the Department of the Army is conducted under Contract DAHC 19-70-C-0012. Training, Motivation, and Leadership research is conducted under Army Project 2Q062107A712.

Meredith P. Crawford
President
Human Resources Research Organization

SUMMARY AND IMPLICATIONS

PROBLEM

In October 1966 the Department of Defense began accepting into the services men with lower aptitudes as part of a massive social experiment, designed both to make effective soldiers of many men who had been considered marginal in ability and to provide them with the training necessary to enable them to lead productive lives as citizens following their military service. Project 100,000, as the experiment was named, was to accept into the Armed Forces, each year, 100,000 men who otherwise would have been ineligible for military service. In undertaking this program, minimum standards of military performance were to be maintained and the overall effectiveness of the services was not to be diminished.

In the past, when standards of selection were modified to accept more men of lower mental ability, as was necessary in times of mobilization, sizable numbers of men with low aptitude scores have shown that they can perform effectively. There has, however, been no systematic study to identify the characteristics of marginal men who are suitable for the Armed Forces, and the kinds of jobs best suited to them.

RESEARCH OBJECTIVES

HumRRO Work Unit UTILITY was designed to provide information about the performance and characteristics of marginal men in the Army. The first objective of the program was to find out how men in Mental Category IV and in other mental categories, as classified under the Armed Forces Qualification Test (AFQT), compared in the performance of selected Army jobs. These comparisons were to include a mapping of areas within jobs where greater and lesser degrees of competence were displayed, in order to provide some information about variations among men in job capabilities or skills. With such information, a basis would be available for estimating how other jobs, not included in the study, might be performed by men in the different mental groups.

The second objective was to identify factors associated with satisfactory performance in different mental category groupings. The intent was to explore both the role of a man's background and personal characteristics and his more general Army experiences (such as the type of training he has received and the length of time he has spent in the job) as they relate to performance.

RESEARCH APPROACH

Five MOSs (Armor Crewman, General Vehicle Repairman, Unit and Organizational Supply Specialist, Medical Specialist, and Cook) were selected for studying the performance and characteristics of both marginal men and comparison groups from the upper aptitude levels. Approximately 375 men were studied in each MOS.

Information about the job effectiveness of each man was obtained through job sample tests, job knowledge tests, and supervisor ratings. Information about each man's background, personal characteristics, and Army experience and training was obtained through biographical questionnaires, a battery of published and experimental tests, and Army records. Information about each man's typical daily job activities was obtained through questionnaires administered to the men themselves and to their supervisors.

Since the research resulted in extensive information dealing with a variety of topics that are best treated separately, the study is being reported as a series. This report, the third in the series, describes the major study findings.

Research on Work Unit UTILITY was initiated in January 1967. In May 1967 the MOSs to be included in the study were selected: Armor Crewman, to provide information about performance in a machine-ascendant job; General Vehicle Repairman, for information about mechanical maintenance jobs requiring diagnostic and interpretive skills; Unit and Organizational Supply Specialist, information about clerical jobs; Medical Specialist, information about a job in which proceduralized tasks are directed toward the care and treatment of individuals;[1] Cook, information about a job typically requiring the reading and following of specified procedures.

Development of job sample and job knowledge tests for these MOSs was begun in July 1967 and completed in April 1968. Data collection was begun in July 1968 and completed in June 1969 with testing conducted at Fort Hood, Texas; Fort Ord, California; Fort Carson, Colorado; Seventh U.S. Army, USAREUR; and selected Army hospitals in the United States.

FINDINGS

The findings of this study are descriptive and restricted to men who were working on a continuing daily basis in four different military jobs. While dirrerent jobs were studied, no distinctions are made between MOSs in this summary because the findings were so similar.

(1) Job performance, as measured by job sample test scores, is directly related to both AFQT and job experience. Job experience, however, shows a more profound effect than AFQT where a considerable overlap in the performance distributions of different AFQT subgroups was observed. While average performance of different AFQT subgroups shows separation up to approximately five years in the job, with time an increasing proportion of men at all AFQT levels appear in the upper ranges of the performance distribution. The data suggest the potential loss of a sizable number of good performers if men with AFQT scores below 20 are excluded from the service. Thirty-three percent of the men in this group with 1-18 months of job experience performed *above* the median,[2] whereas 25% of the 65-99 AFQT group scored below the median. Fifty percent of the 0-20 AFQT group with 19-30 months of job experience and 85% with more than 30 months of job experience scored above this same median.

(2) Separation in the performance of different AFQT groups on Job Sample subtests increases as the subtests increase in difficulty.

(3) Beyond 30 months of job experience, there is a clear and stable floor of performance. This floor could be used to define minimum acceptable performance.

(4) Job Knowledge scores correlated more highly with Job Sample scores than any other variable in the study (except job experience).

[1] Because considerable job specialization was found in this MOS, and because sampling procedures and data analyses differed from those followed for the other four jobs, data for the Medical Specialist are not included in this report.

[2] The median was calculated using all AFQT groups with 1-18 month's job experience.

(5) Supervisor Ratings (scales of the Commander's Evaluation Report) do not differentiate men at different AFQT or job experience levels. The ratings are highly skewed toward the favorable end of the scale and bear only a moderate relationship to Job Sample and Job Knowledge criteria.

(6) AFQT is not related to the types of tasks a man is assigned in his job, nor to the frequency with which he performs them. The amount of time he has been in his job may be related to some of the tasks he performs.

(7) The job performance, as measured by job sample tests, of Caucasians and Negroes does not differ despite the lower average AFQT of the latter.

(8) Job performance of inductees and enlistees does not differ during their first 23 months in the Army.

IMPLICATIONS

Based upon the results of this study, the primary implications are:

(1) The Army could continue its present policy of accepting men at lower AFQT levels. If that policy were to continue, a sizable proportion of the lower aptitude men would perform at acceptable levels. Acceptable performance was defined in terms of the distribution of Job Sample scores of men with more than 30 months of experience (whose scores were considered to represent the range of normal and expected performance for experienced job incumbents). This definition is suggested as an alternative to present Army reenlistment requirements. Averaging across the four MOSs of the study, 29% of the 0-20 AFQT group could reenlist if either current reenlistment requirements or the definition of acceptable performance were applied; an additional 19% of this AFQT group could reenlist using the acceptable performance definition who do not meet the Army's current reenlistment requirement; finally, using a performance standard, 30% of the ineffective performers in this AFQT group would be screened out who are currently eligible to reenlist.

(2) Screening for retention could be undertaken at the time of the first reenlistment. Such screening could be based at least partly upon scores obtained in Job Knowledge tests. In addition, a man's record of conduct in the military prior to the time of reenlistment would undoubtedly be useful in conjunction with this Job Knowledge test score.

(3) Supervisor Ratings (Commander's Evaluation Report) provide evaluations of general personality characteristics rather than of job proficiency; they are highly susceptible to rater bias, and they fail to provide useful discriminations between men with regard to job performance.

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Performance in Four Army Jobs by Men at Different Aptitude (AFQT) Levels: 3. The Relationship of AFQT and Job Experience to Job Performance

Chapter 1

INTRODUCTION

This report describes the performance of men in four Army jobs—Armor Crewman, General Vehicle Repairman, Unit and Organizational Supply Specialist, and Cook—that were included in HumRRO Work Unit UTILITY,[1] a comparative study of the performance of men in different mental ability groups. Work Unit UTILITY had two objectives:

(1) To find out how men in Category IV[2] and other mental categories compare in the performance of selected Army jobs. These comparisons include a mapping of areas within jobs where greater and lesser degrees of competence are displayed. The latter activity is aimed at providing information about variations among men in capabilities or skills, which in turn should provide a basis for estimating how other jobs, not included in the study, might be performed by men in the different mental groups.

(2) To identify factors associated with satisfactory performance in different mental category groupings. The intent is to explore both the role of a man's background and personal characteristics and his more general Army experiences (such as the type of training he has received and the length of time he has spent in the job) as they relate to performance.

The overall design of the study and the data collection instruments used in it have been described in detail in previous reports (1, 2). This report describes job performance and job activities as they vary in accordance with the main study variables—Armed Forces Qualification Test (AFQT) level and amount of job experience. A subsequent report will describe interrelationships among different performance criteria (3).

A man's job performance was assessed in three ways:

(1) Performance on an objectively scored job sample test involving representative tasks taken from the job. Depending on the job, the test took from three to five hours to complete.

(2) Performance on a multiple choice paper-and-pencil job knowledge test.

(3) Performance and overall suitability as viewed by a supervisor. Two supervisor rating scales were completed by each man's immediate supervisor; one of these was the Enlisted Efficiency Report used operationally in the Army.

In addition to job performance, a man's general military suitability was assessed in terms of the frequency of entries for any form of misconduct appearing in his permanent record.

The general manner in which these measures of job and overall effectiveness vary jointly with AFQT level and amount of job experience is described in Chapter 2. Included is an analysis of the daily job duties performed by men in different AFQT and job experience groupings. Chapter 3 provides comparisons of performance of special subgroups within the sample including Negroes and Caucasians, inductees and enlistees, and men with formal and on-the-job training.

[1] Because considerable job specialization was found in the Medical Specialist MOS originally included in the study, and because sampling procedures and data analyses for this MOS differed from those followed for the other four jobs, data for the Medical Specialist are not included in this report.

[2] As used in this report, Category IV includes men in Mental Categories IV and V—i.e., men whose score on the Armed Forces Qualification Test (AFQT) range from 0-30.

Chapter 4 provides a criteria of acceptable performance based on job sample test scores. Included is an analysis of the relationship between acceptable performance and eligibility to reenlist. In Chapter 5, a procedure is described for using paper-and-pencil job knowledge tests for screening ineffective performers at the time of first reenlistment.

Chapter 2

THE RELATIONSHIP OF AFQT AND JOB EXPERIENCE TO JOB PERFORMANCE

The manner in which a man performs a job depends largely upon his abilities, his experiences, and his motivations. He must possess the requisite aptitudes necessary for acquiring the specific knowledge and skills involved in each job action. He must have been exposed to situations in which knowledge can be acquired and skill practiced. And he must possess motives and attitudes that lead him to learn and, having learned, to perform.

In this study the individual and combined effects of ability and experience as they relate to job performance were studied directly.

MEASURES OF ABILITY AND EXPERIENCE

The Armed Forces Qualification Test (AFQT) was used as a measure of general ability. Every man considered for military service takes the AFQT to determine whether he is mentally qualified for service. The test is used to measure his ability to absorb military training. The items comprising the test are distributed among four content areas: Verbal Ability, Arithmetic Reasoning, Spatial Relations, and Tool Functions. For operational purposes the Army classifies men into five mental groups or grades on the basis of their total score on this test:[1]

Mental Group	Percentile Score
I	93-100
II	65- 92
III	31- 64
IV	10- 30
V	0- 9

The experience of a man was considered in terms of the total length of time he had worked in a job. All men were working daily in their jobs at the time of the study. Job experience ranged from one month to over 20 years.

[1] Prior to September 1966, an AFQT score of 10 was fixed (1951 Universal Military Training and Service Act) as a minimum for entrance into the service, making Mental Group V examinees ineligible for service. See Reference 1 for the manner in which standards for induction and enlistment were modified for men in Mental Groups IV and V with the advent of Project 100,000.

The numbers of subjects in five mental groupings and five levels of job experience[1] are as follows:

For AFQT—

	0-20	21-30	31-47	48-64	65-99	Total
Armor Crewman	97	93	62	65	63	380
Repairman	92	103	64	74	57	390
Supply Specialist	100	98	62	59	77	396
Cook	108	81	77	58	54	378

For Months on Job—

	1-3	4-9	10-15	16-24	25+	Total
Armor Crewman	37	72	61	68	142	380
Repairman	65	97	53	93	82	390
Supply Specialist	40	151	63	49	93	396
Cook	90	152	28	56	52	378

Though its importance as a determinant of job behavior is fully recognized, motivation was not treated as a variable in this study. In the absence of accepted methods for assessing motivation, the role of this variable was considered beyond the scope of the study.

PERFORMANCE ON JOB SAMPLE TESTS

This section contains the results of job sample testing of men in four Army jobs. Performance is examined as it varies according to AFQT level and months of job experience. Individual scores and grouped data are provided.

SCATTER DIAGRAMS

Scatter diagrams of individual performance are given in Figures 1-4 for Armor Crewman, Repairman, Supply Specialist, and Cook. They provide a picture of the changing pattern of scores across the broad range of job experience of the sample and show the considerable overlap of the Mental Category IV and Mental Categories I-III distributions. In each Figure, Job Sample Test total scores appear on the ordinate and months-on-the-job appear on the abscissa.

The overall patterns appearing in the scatter diagrams are quite similar. A significant aspect is the presence of men in Mental Category IV at the upper end of the distribution. The overlap of Category IV with Categories I-III is of particular interest: There are Category IVs who score very high even in their early months on the job, and conversely, there are men in the higher mental categories who perform poorly.

In each MOS there is great variability among men in both mental category groups during the first 30 months of job experience. Scores for the upper 95% of the distributions average between 32% and 91% of the total possible score (see Table 1). After 30 months, the majority of scores fall within a more restricted range at the upper end of the distribution, with a rather clear and stable floor of performance being evident. Here scores for the upper 95% of the distributions average between 58% and 92% of the total score. In addition to a decrease in range, performance predictably improved with job experience.

[1] Some analyses involved other breaks for job experience than given here.

Job Sample Test Data: Armor Crewman

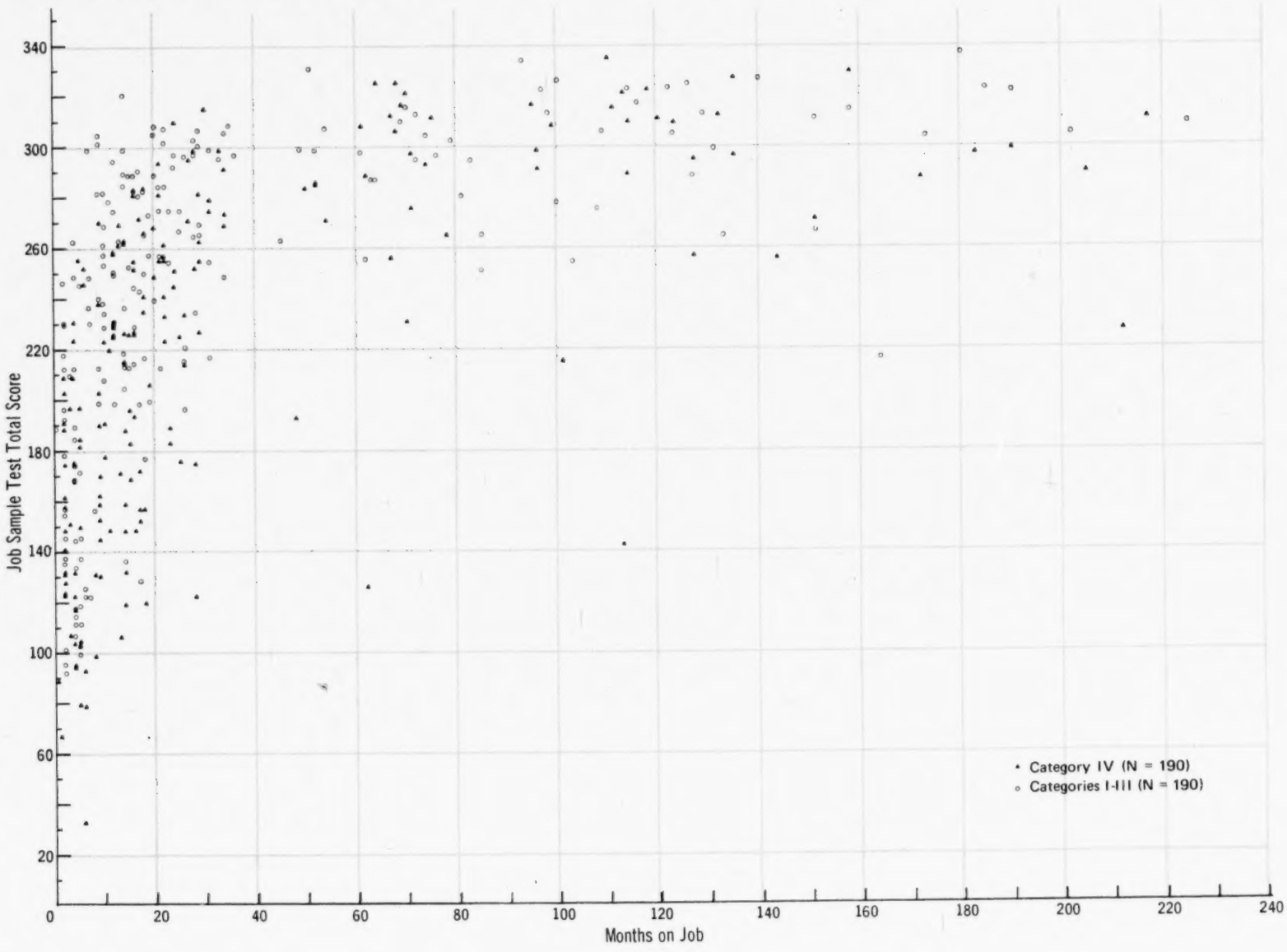

Figure 1

Job Sample Test Data: Repairman

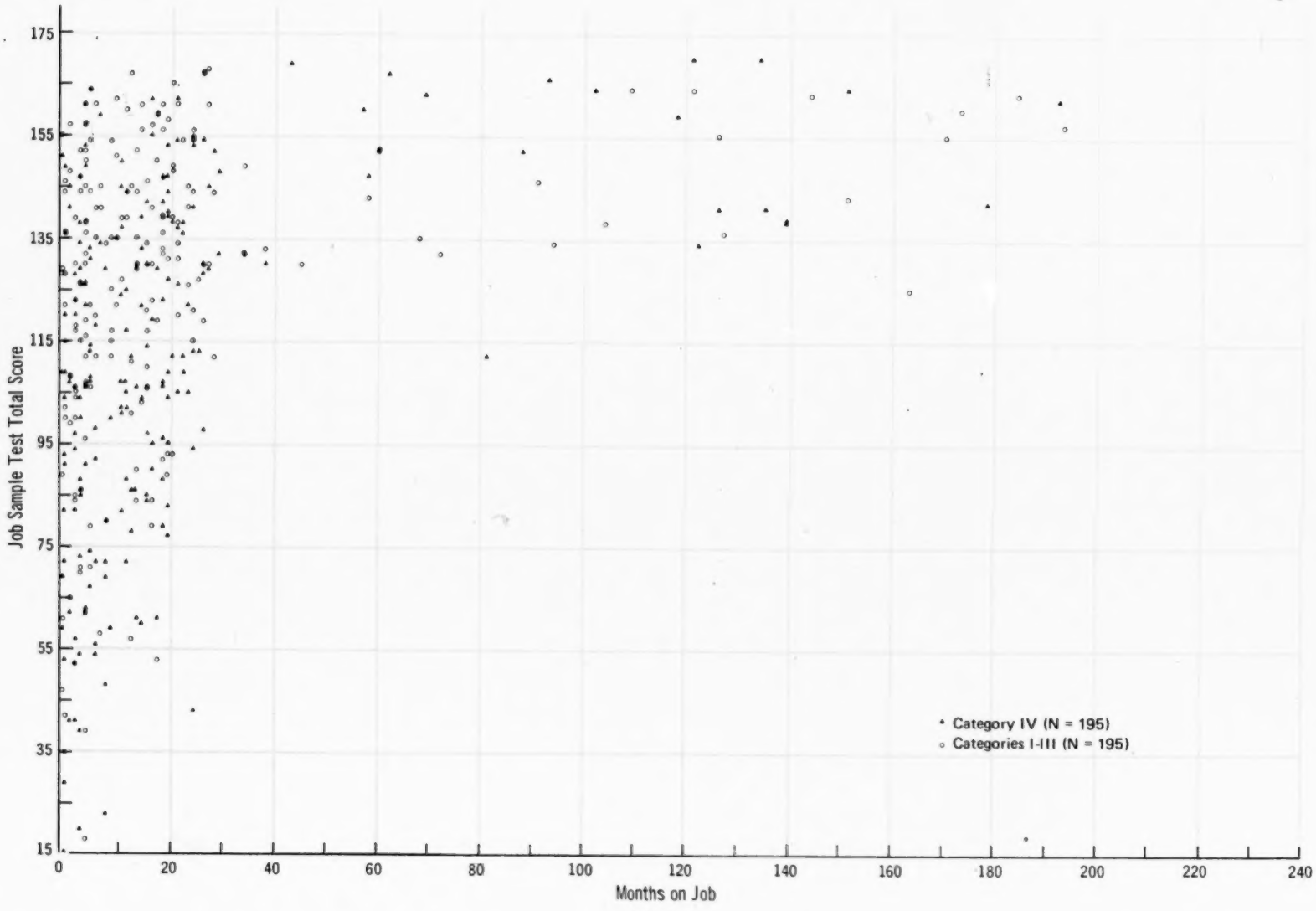

Figure 2

Job Sample Test Data: Supply Specialist

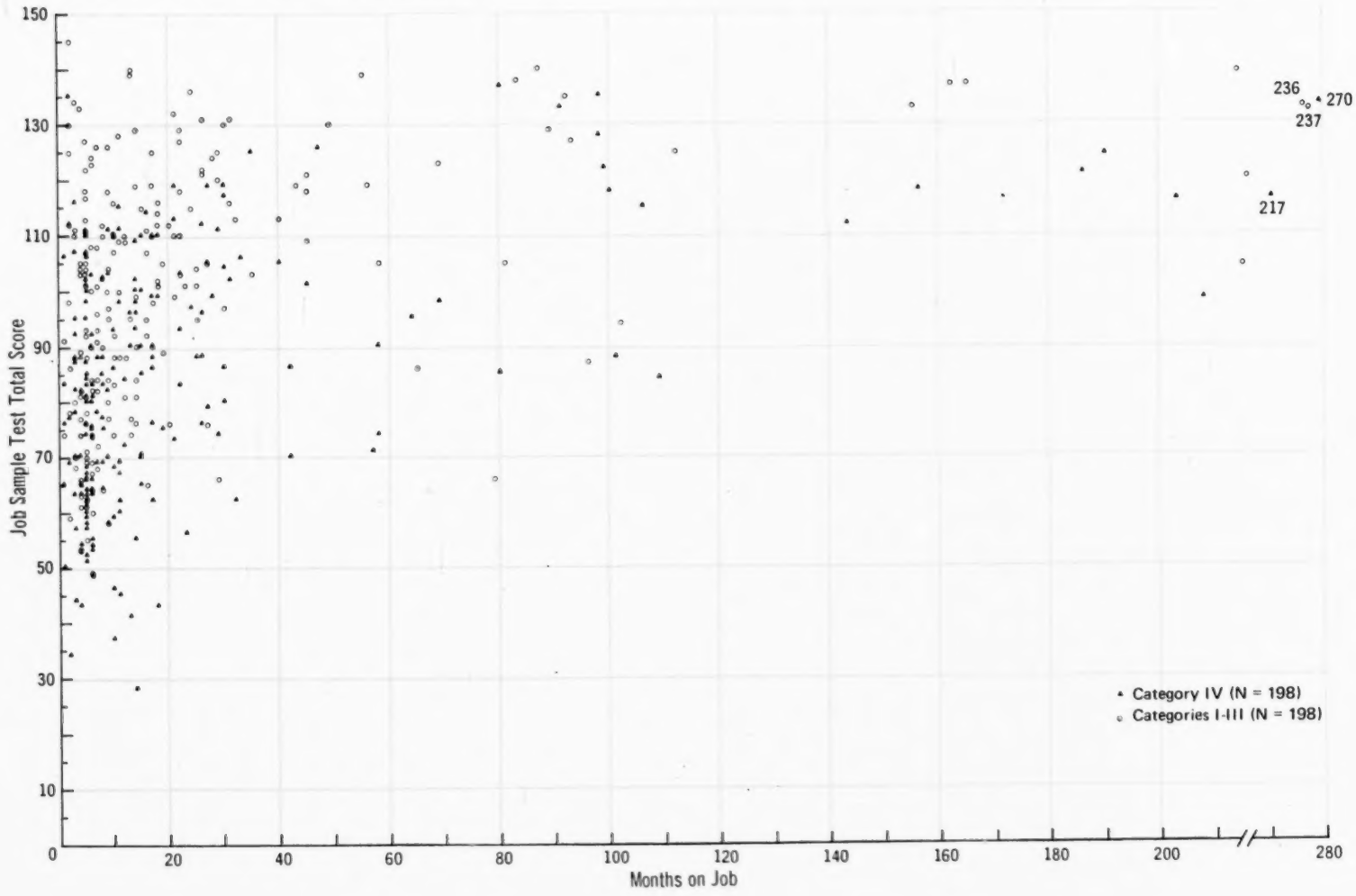

Figure 3

Job Sample Test Data: Cook

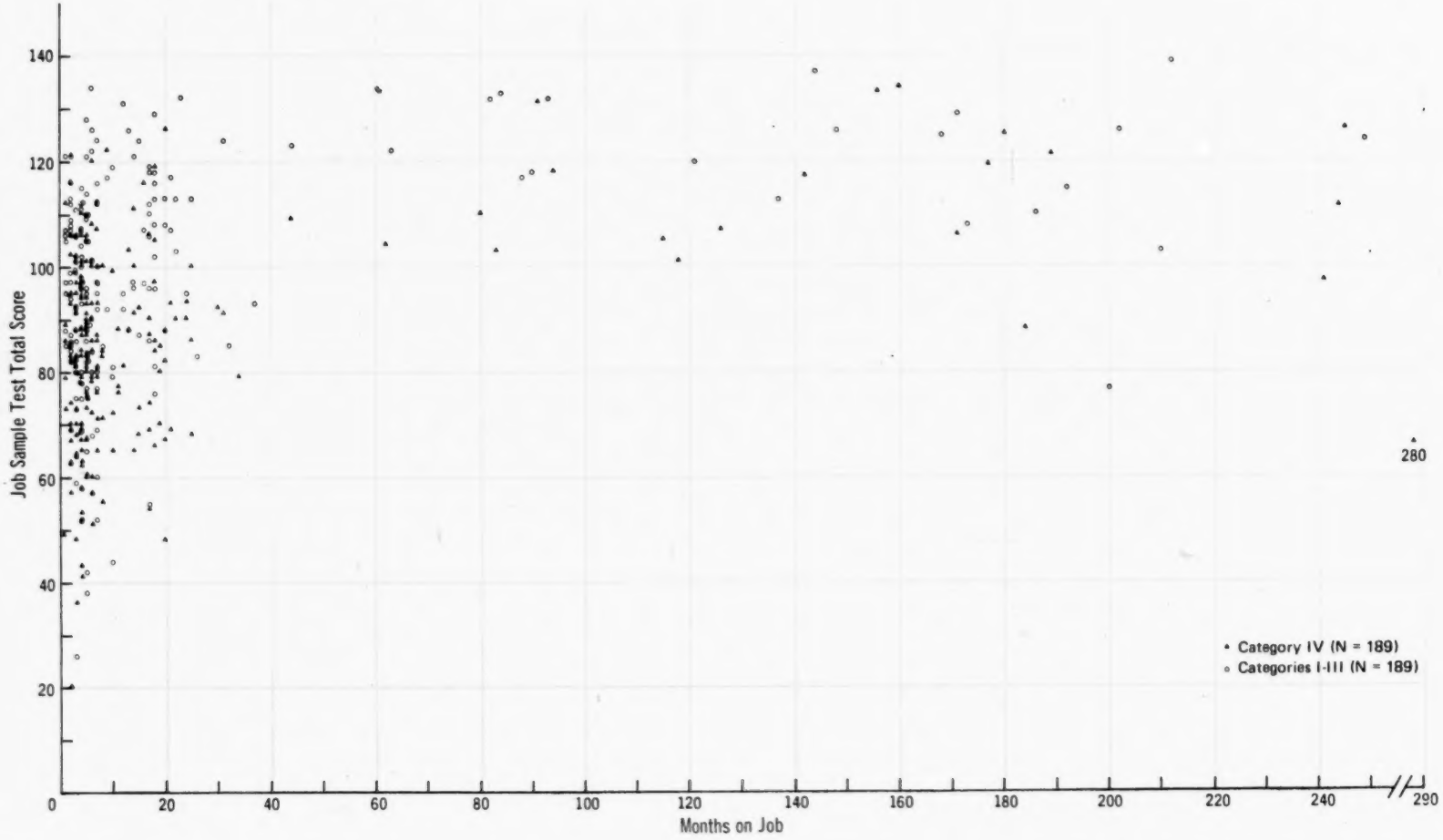

Figure 4

Table 1

Two Characteristics of the Scatter Diagrams

MOS	N		Score (%) Range of Upper 95% of Group		Percent of Group Correct on at Least Half of Items	
	0-30 MOJ[a]	31+ MOJ	0-30 MOJ	31+ MOJ	0-30 MOJ	31+ MOJ
Armor Crewman	267	113	29-89	64-94	68	98
Repairman	344	46	30-95	74-97	79	100
Supply Specialist	333	63	35-93	46-90	67	84
Cook	330	48	34-87	50-88	41	93
Average			32-91	58-92	64	94

[a]MOJ = months on job.

While, on the average, 64% of the men with less than 30 months of job experience earn at least half of the possible test points, 94% of the men with more than 30 months of experience are above the 50% point. While these changes presumably reflect the effects of increasing job experience, it must be noted that this pattern may represent some composite of the effects of job experience and of selective reenlistment and reassignment processes. In a cross-sectional study, such as this one, it is not possible to isolate the effects of selection.[1]

GROUPED DATA

For the remainder of the report, data have been grouped using several levels of AFQT and job experience. The performance of three different AFQT groups over six levels of time are shown in Figures 5-8 for four Army jobs. The same data, regrouped according to three levels of job experience, are plotted by five AFQT intervals in Figures 9-12.[2]

In graphing the data, the groups have been organized to display as many points at various AFQT or time intervals as the number of subjects and the regularity of the data permit. Statistical tests of differences between groups, presented subsequently, are confined to more restricted groupings with considerably larger numbers of subjects.

In Figures 5-8 the data have been plotted to provide differentiation of Mental Group IV into upper and lower levels since the study focuses primarily on this marginal group.

While the Job Sample curves in different MOSs showed some variations in rate of growth with different amounts of displacement between comparable groups from one graph to another, the overall pattern is clear. Performance improves both as a function of

[1] HumRRO Work Unit FOLLOWTHRU was initiated in FY 1971, to identify men in the UTILITY sample who reenlisted after their first tour in the Army, and to compare characteristics of this group with those who separated.

[2] Supporting data for Figures 5-12, and all remaining figures, are contained in Appendix A, where Tables A-1—A-8 correspond to Figures 5-12.

Armor Crewman's Job Sample Score by Time on Job for AFQT Groups

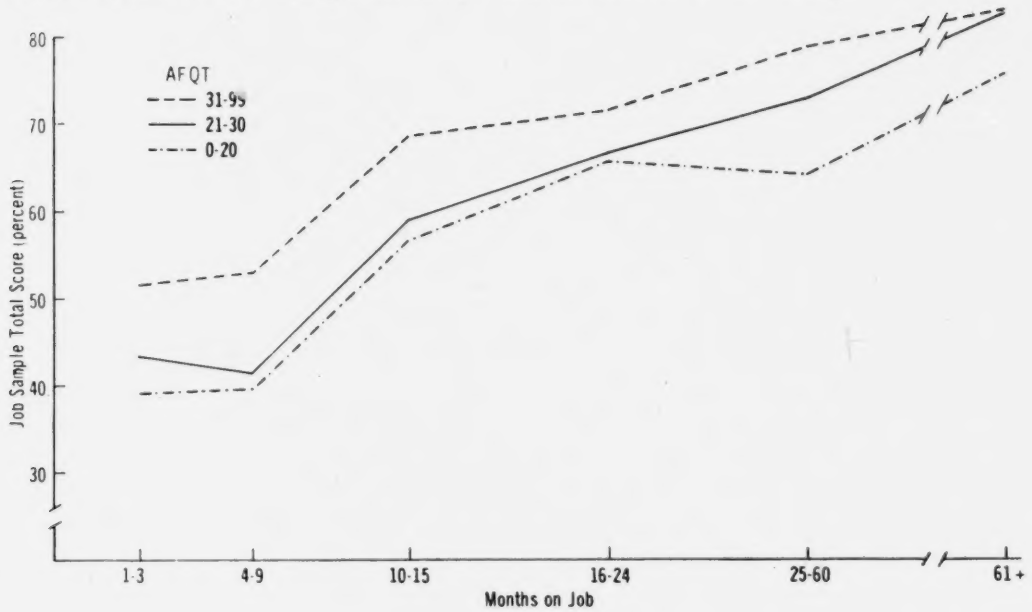

Figure 5

Repairman's Job Sample Score by Time on Job for AFQT Groups

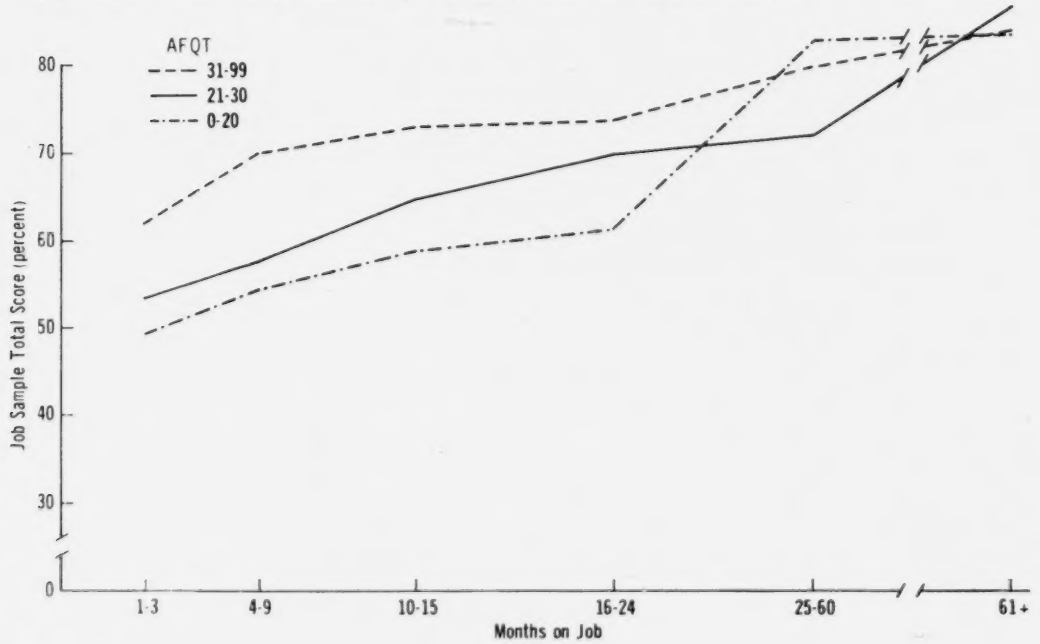

Figure 6

Supply Specialist's Job Sample Score by Time on Job for AFQT Groups

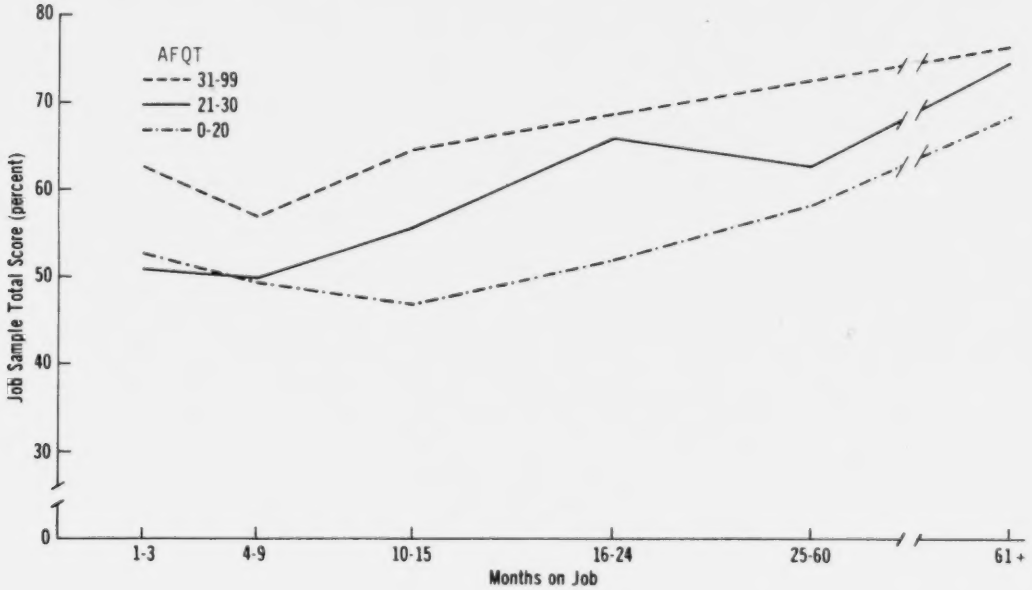

Figure 7

Cook's Job Sample Score by Time on Job for AFQT Groups

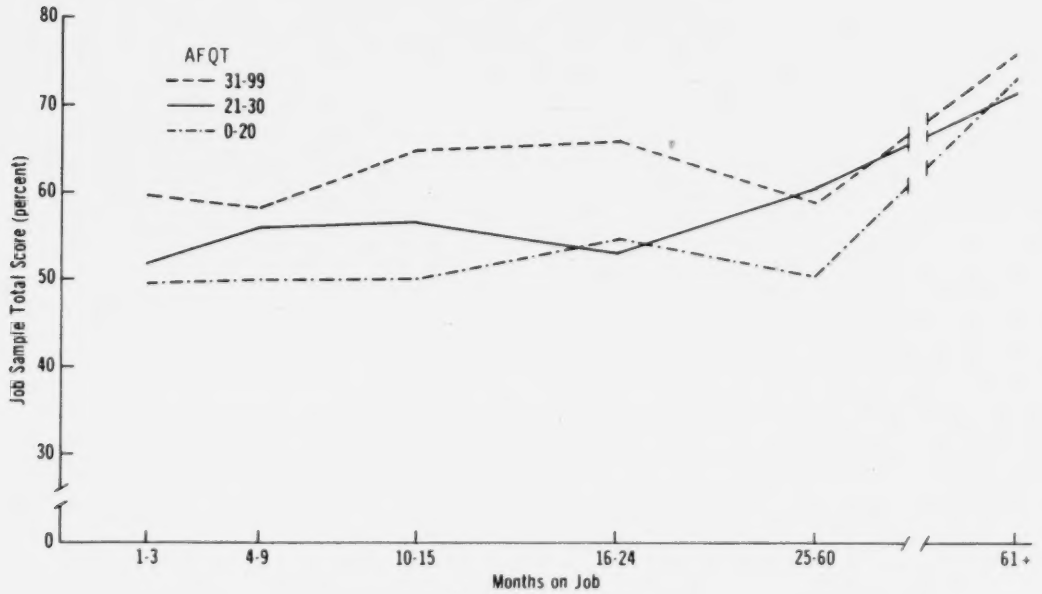

Figure 8

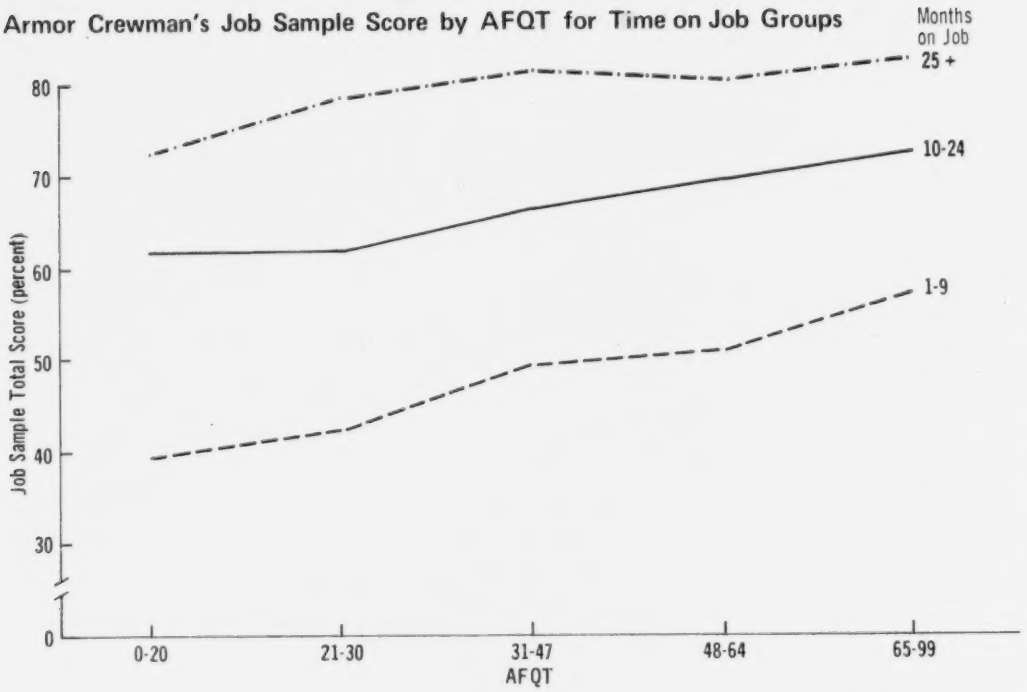

Figure 9

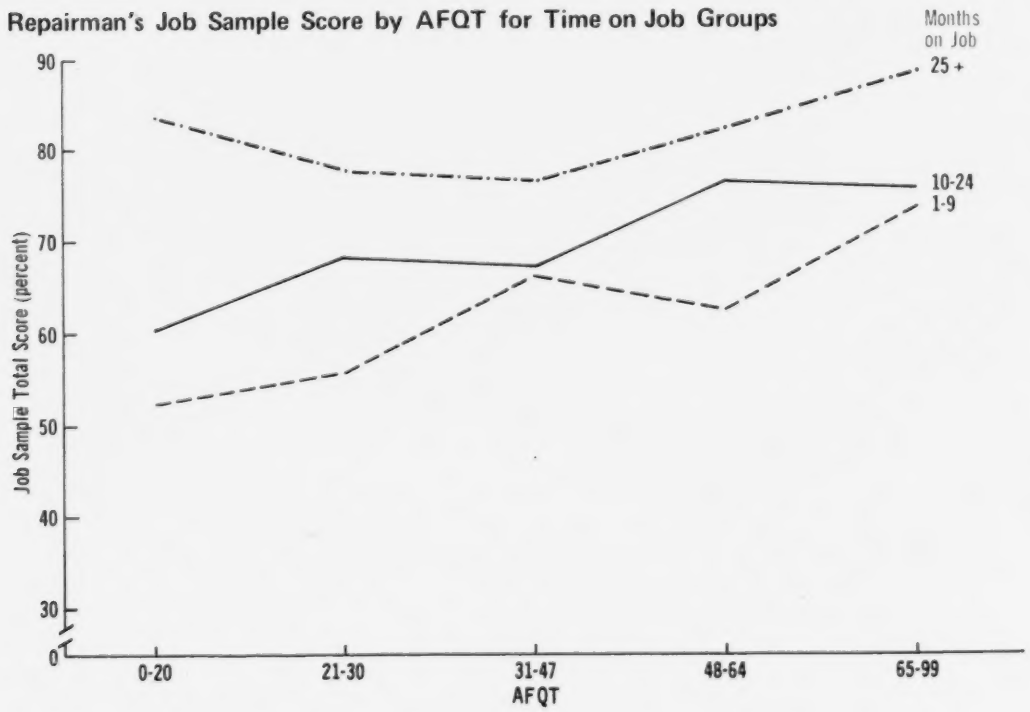

Figure 10

Supply Specialist's Job Sample Score by AFQT for Time on Job Groups

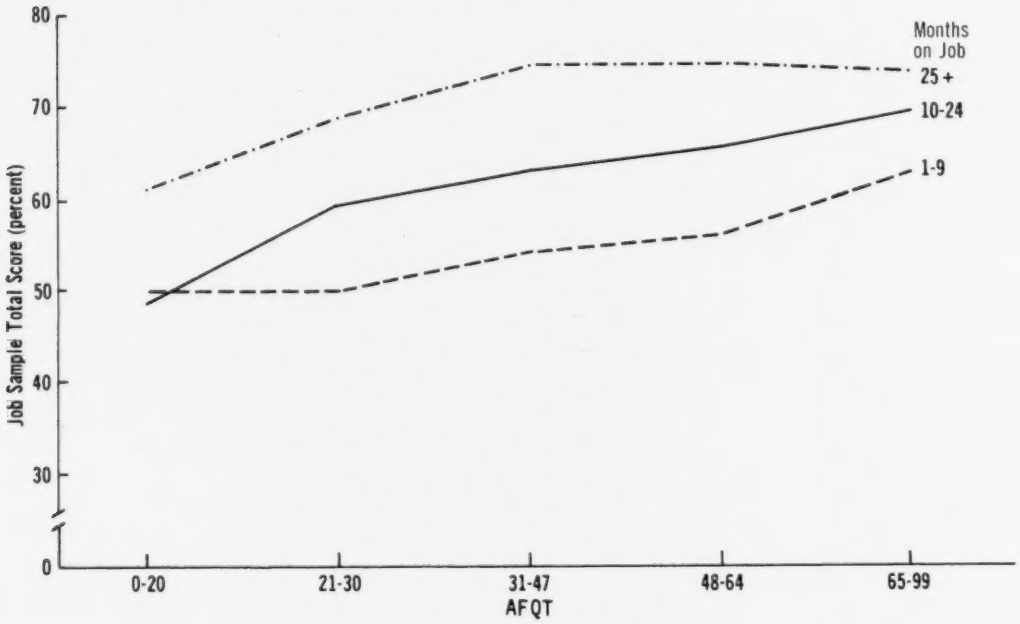

Figure 11

Cook's Job Sample Score by AFQT for Time on Job Groups

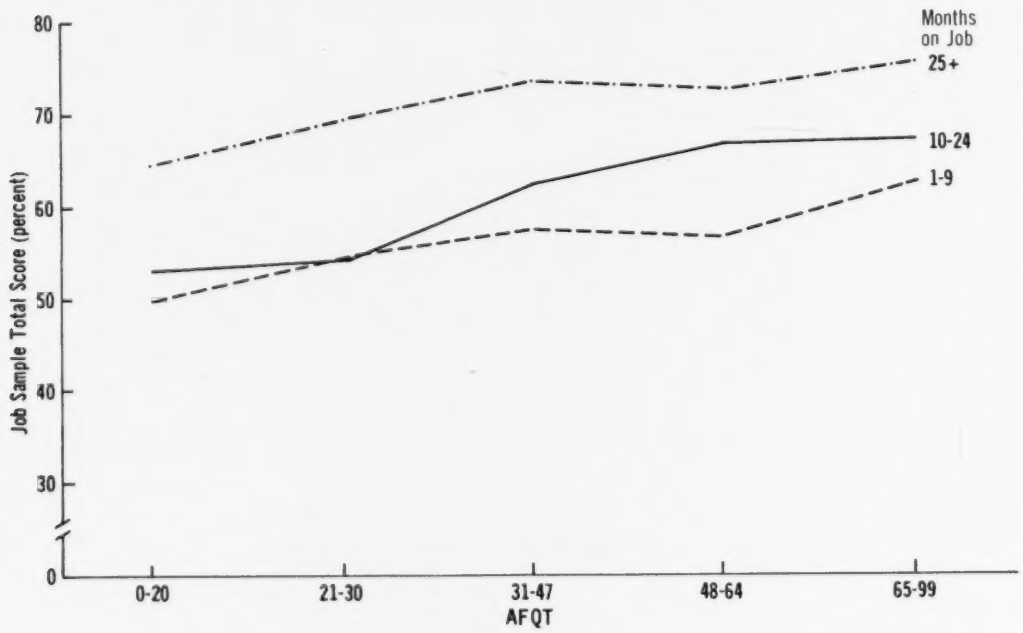

Figure 12

increasing AFQT and increasing time on the job. This is seen most clearly where comparisons are made between curves representing the variable being considered.

In general, through five years on the job, 31-99 AFQT groups exceed 21-30 AFQT groups, which in turn exceed 0-20 AFQT groups (Figures 5-8). Beyond five years there is some evidence of convergence. The points are closer together and positioning relative to AFQT is lost in at least two of the jobs. For time-on-job curves there is almost perfect separation with the 25+ months curves exceeding the 10-24 months curves, which likewise exceed the 1-9 months curves (Figures 9-12). There is no reason to believe that irregularities in growth, where they do occur, are attributable to other than random variation arising most commonly where the number of subjects is small.

While the graphs using means show clear separation between AFQT groupings out to at least five years, it has been obvious in the scatter diagrams that a great deal of overlap exists. An alternate method of presenting data is to group subjects according to their position in the Job Sample distribution. In Figure 13 (Table A-9 in Appendix A) the percentages of men in the different AFQT groupings falling in the lowest, two middle, and highest quarters of the Job Sample distribution are presented. The figure is drawn for men with 1-18 months of job experience for all MOSs combined.

Distribution of AFQT Groups With 1-18 Months-on-Job on Job Sample Tests *(Four MOSs Combined)*

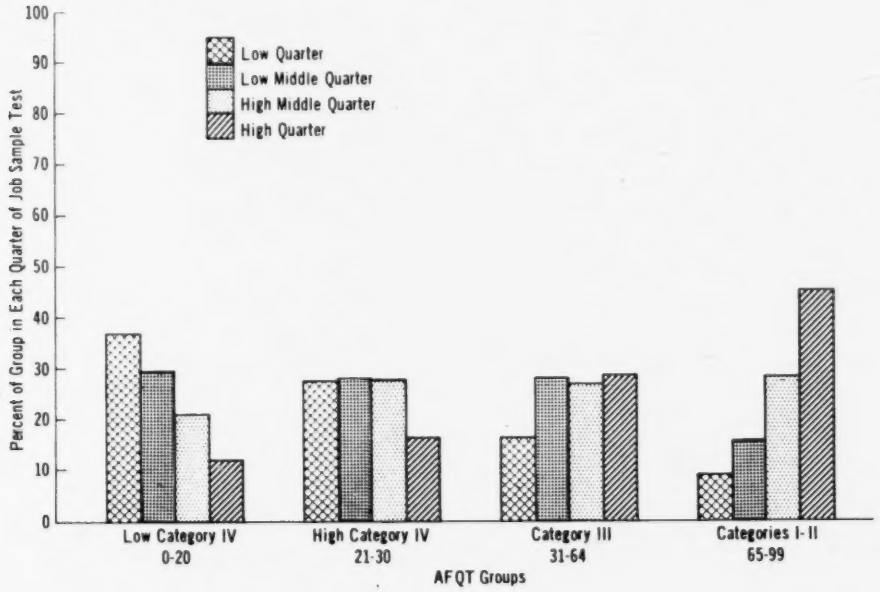

Figure 13

Figure 13 reflects the general relationship between AFQT and job performance. It can be seen that there is a greater probability that men at the lower end of the AFQT distribution will perform in the lowest quarter. This is mirrored at the high end of the distribution where men are most likely to score in the highest quarter. However, the critical observation is that a substantial proportion of men at all AFQT levels falls into each quarter of the Job Sample distribution. For example, 33% of the 0-20 AFQT group score in the upper half of the distribution, whereas 25% of the 65-99 AFQT group score

in the lower half of the distribution. In the first 18 months the similarity of performance of the High Category IVs and the Category IIIs is striking. A little less than half (44%) of the High Category IV group scored above the median, whereas a little more than half (56%) of the Category IIIs scored above the median (the latter group having been historically acceptable for service).

Men with between 1 and 18 months of job experience made up 67% of the UTILITY sample in the four MOSs reported. The Army, in general, is heavily weighted with men from this time segment—approximately the first two years of a first tour. Since, at any given time, most men working in an MOS fall within this first year and a half of job experience, performance in this time segment approximates modal performance in the Army. The data for men with longer job experience have been sorted into the quarters[1] used for the 1-18 month group to compare their performance. Figures 14 and 15 (Tables A-10 and A-11, Appendix A) display these data.

The implications to be drawn from these Figures are clear. With time, an increasing proportion of men at all AFQT levels appear in the upper ranges of the performance distribution. Thus, among men with 19-30 months-of-job experience, 50% of the Low Category IV group fall in the upper half of the distribution. In the 30+ months group, 85% of the Low Category IV group fall in this upper half. These data suggest the potential loss of a sizable number of good performers in the first 18 months on the job, as well as even larger numbers of good performers beyond 18 months, if men with AFQT scores below 20 are excluded from the service.

Correlations among Job Sample scores, AFQT, education, months on job (MOJ),[2] and age are given in Table 2. The education and age variables have been included in the analysis because they are related to AFQT and MOJ.

Here and elsewhere in this report multiple correlations and zero-order and partial correlations were used to estimate the strengths of relationships. Where differences between effects were tested, analyses of covariance were carried out. Both of these techniques are particularly suitable in studies where breaks in such continuous dimensions as time on the job must be arbitrarily introduced and where the number of subjects per level cannot be controlled experimentally, resulting in cells with markedly disproportionate Ns.

The zero-order correlations (or Pearson rs) appearing on the right side of the table show the intercorrelations of each of the variables and their correlations with the Job Sample criterion score. Except for the correlations of AFQT with education and MOJ with age, the intercorrelations do not show any significant relationships. The correlations of AFQT with education are fairly low while, not surprisingly, the correlations of MOJ with age are substantial.

[1] A scale was developed that divided performance score ranges for 1-18 months on job (MOJ) into equi-populous segments. It was then ascertained what proportions of more experienced people fit into those quarters.

[2] Where months on the job, an index of job experience, is introduced in correlational analyses and analyses of covariance, a logarithmic transformation has been applied to time in an attempt to approximate a distribution more in keeping with the actual relationship between time and effective job experience. It is clear that the gain in job experience or job proficiency to be expected from a given increase in time on the job diminishes as the number of years on the job increases. While the precise shape of this decreasing function depends upon many factors and undoubtedly varies somewhat from job to job, logarithmic scaling provides a reasonable approximation to the experiential effects of time. Time expressed in logarithmic units has been a conventional technique for dealing with time measures.

In addition to transforming time into a more direct measure of job experience, this transformation has the further benefit of reducing the curvilinearity seen in the plots of test performance by months on the job. With this reduction in curvilinearity, statistical procedures based on linear models become more appropriate. The computed correlations will more closely approach their true value and adjustments introduced in the analyses of covariance using these correlations will be more accurate.

Distribution of AFQT Groups With 19-30 Months-on-Job on Job Sample Tests *(Four MOSs Combined—in Relation to Quarters of 1-18 MOJ Subsample)*

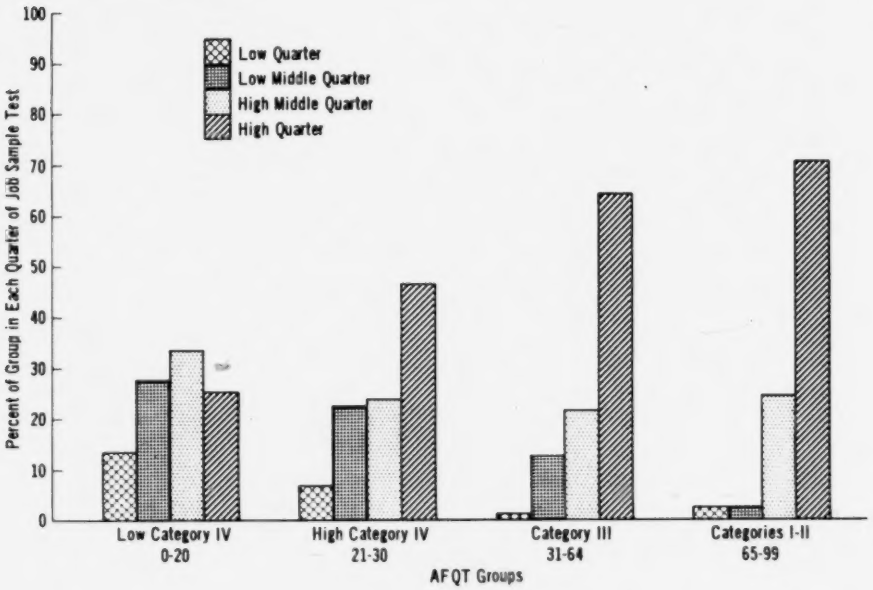

Figure 14

Distribution of AFQT Groups With 31+ Months-on-Job on Job Sample Tests *(Four MOSs Combined—in Relation to Quarters of 1-18 MOJ Subsample)*

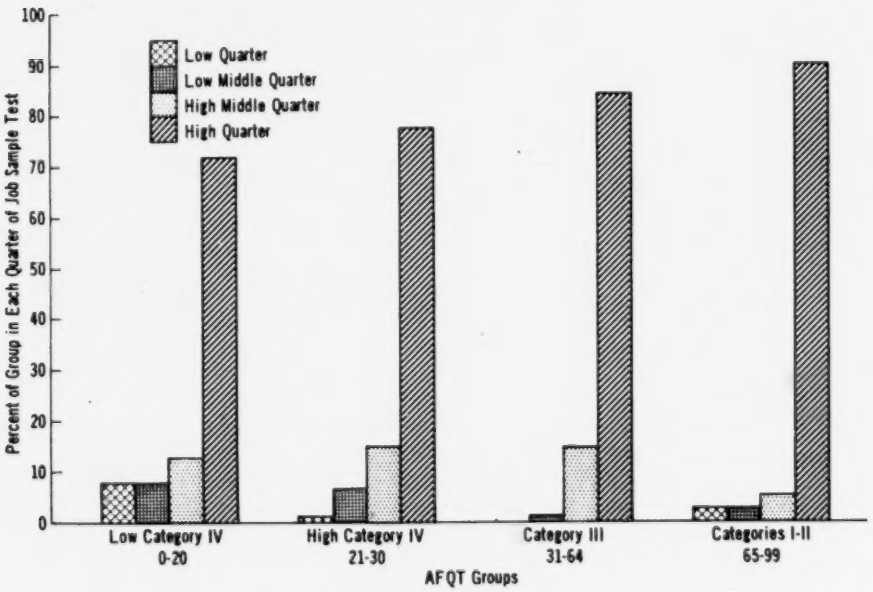

Figure 15

Table 2

Multiple Correlations (R) for Two Variables With Job Sample Total Score[a] (Zero-Order Correlation Matrix for Five Variables)

MOS	Variable	Partial Correlation With Job Sample, and *R*	Zero-Order Correlation of Five Variables			
			Education	MOJ	Age	Job Sample
Armor Crewman	AFQT	.36*	.24*	.01	−.05	.27*
	Education			.00	.02	.04
	MOJ	.71*			.74*	.69*
	Age					.41*
		R=.74				
		p<.01				
Repairman	AFQT	.32*	.25*	.02	−.03	.30*
	Education			.00	−.01	.08
	MOJ	.44*			.57*	.43*
	Age					.31*
		R=.52				
		p<.01				
Supply Specialist	AFQT	.38*	.26*	.01	−.02	.35*
	Education			−.05	−.06	.14*
	MOJ	.46*			.53*	.43*
	Age					.33*
		R=.55				
		p<.01				
Cook	AFQT	.35*	.28*	.03	.03	.33*
	Education			.01	.03	.12*
	MOJ	.40*			.75*	.39*
	Age					.39*
		R=.50				
		p<.01				

[a]* Indicates statistical significance (*p*<.05)

The zero-order correlations of each of the predictors with the criterion show a moderate relationship for AFQT, a negligible relationship for education, and, rather consistently, the highest relationship between MOJ and performance. Age, as indicated above, varies with MOJ and generally provides the next strongest relationship with performance on the Job Sample test.

Multiple correlation coefficients were computed using two variables as predictors (AFQT and MOJ) and using four variables as predictors (AFQT, education, MOJ, and age). These multiple correlation coefficients were so similar, with no gain in prediction where four variables were included, that only the simpler Multiple R using two variables is reported.

Here and elsewhere in the report, there is little or no discussion of the multiple correlations themselves. While they have been reported to provide information on the variability in performance that is jointly attributable to the main study variables, AFQT and MOJ, major attention has been devoted to those correlations which serve a more analytic purpose (partial and zero-order rs). Of primary interest are two partial rs obtained in each analysis which provide the best estimates of the relative contributions of AFQT and MOJ to performance. Partial correlations provide a more precise estimate of relationships than zero-order correlations because they have been corrected for variance which they hold in common with the other variables in a multiple correlational analysis. In Table 2, partial correlations between MOJ and performance are free of the effects of AFQT, and likewise, partial correlations between AFQT and performance are free of any effects attributable to MOJ.

An examination of the partial rs indicates that MOJ is more highly related to Job Sample scores than AFQT. The highest correlation, in Armor Crewman, occurs in the MOS where scores on the Job Sample test are most dependent upon a subject's knowledge and memory. (No manuals were available as a source of information.)

When the zero-order and partial rs between either AFQT or MOJ and Job Sample scores are examined, the zero-order correlations are found to be slightly smaller. This suggests the possible influence of a suppressor variable.[1] (This suppressor effect will be seen to be somewhat stronger in the correlations with Job Knowledge.)

The independent effects of AFQT and MOJ on mean Job Sample scores are shown in Tables 3 and 4. Where AFQT is the independent variable, the contributions of MOJ and age have been statistically controlled using analysis of covariance (Table 3). Where MOJ is the independent variable, the contributions of AFQT and Education have been statistically controlled (Table 4).

Comparisons of the raw and adjusted means in Table 3 show that the effect of the adjustment is to slightly reduce the range of the means. Subsequent tables of analysis of covariance will continue to show this same effect.

The primary result of the adjustment in Table 3 is to raise the mean for the 0-20 AFQT group which consistently has fewer months of job experience. In all likelihood, the lower average experience in this group is partly attributable to the fact that individuals with lower aptitudes—PROJECT 100,000—had only recently entered the Army.

Examination of the adjusted Job Sample means shows that in each MOS there is a consistent difference between AFQT groups. In each MOS the overall tests of significance (F test) and specific tests of differences between means indicate that all differences are reliable.[2]

In Table 4 AFQT and educational levels for all groups are roughly comparable. Thus, the effects of the adjustment for these variables tend to be small. Comparison of the Job Sample means in this table shows consistent differences attributable to MOJ. With the exception of low Category IVs vs. high Category IVs for Cooks, all differences are reliable.

As suggested by comparing both the means in these tables and the graphs representing each variable (Figures 5-8 for AFQT and Figures 9-12 for MOJ), the absolute

[1] A suppressor variable correlates positively with a predictor and has only low correlation with the criterion. When the suppressor variable is partialed out, part of the unrelated variance between the predictor and the criterion is removed, raising the value of the correlation. In the present instance, some component of MOJ is presumably related to AFQT but unrelated to performance. Its presence in the zero-order correlation between AFQT and Job Sample scores suppresses the AFQT-Job Sample correlation.

[2] All comparisons between pairs of means were carried out using the Newman-Keuls method for tests at the .05 level as discussed in Winer (4).

Table 3

Comparison of Three AFQT Levels on Job Sample Total Score

MOS	AFQT	N	Raw Mean	Adjusted Mean	Means on Adjusting Variables		Differences Between Means		
					MOJ	Age	Low IV vs. High IV	Low IV vs. Non-IV	High IV vs. Non-IV
Armor Crewman	0-20	97	204.84	213.14	29.63	23.47			
	21-30	92	233.65	226.97	23.19	25.39			
	31-99	187	249.06	248.04	38.54	23.76			
		F=19.79, df=2 and 371, $p<.05$					Sig.	Sig.	Sig.
Repairman	0-20	91	102.11	104.89	16.34	22.75			
	21-30	103	118.68	115.70	28.13	23.22			
	31-99	193	127.49	127.77	23.19	22.53			
		F=20.47, df=2 and 382, $p<.05$					Sig.	Sig.	Sig.
Supply Specialist	0-20	100	79.93	82.05	15.37	24.22			
	21-30	98	91.29	89.42	34.19	25.23			
	31-99	198	100.06	99.90	24.29	24.76			
		F=28.02, df=2 and 391, $p<.05$					Sig.	Sig.	Sig.
Cook	0-20	106	81.70	82.90	14.33	22.01			
	21-30	78	91.45	89.79	23.10	23.19			
	31-99	182	98.38	98.40	23.90	22.64			
		F=24.52, df=2 and 361, $p<.05$					Sig.	Sig.	Sig.

differences in performance associated with MOJ (and age) are greater than differences associated with AFQT (and education).

Although the size of differences between AFQT or job experience groupings obviously depends on the particular groups one selects for comparison, larger differences appear across the job experience dimension than across the AFQT dimension.

INDEPENDENT PERFORMANCE ON JOB SAMPLE TESTS

In the Armor Crewman and Repairman Job Sample tests, prompts on individual subtest steps were given, where necessary, to enable men to proceed with the test.[1] If a man required prompting on three successive steps or on a total of four steps, the subtest was terminated. From the prompt record of each subject it was possible, therefore, to describe a man's ability to work virtually without assistance (zero or one prompt per subtest) or his inability to complete a subtest (three successive or four total prompts).

In the Supply Job Sample Test, two varieties of critical errors were recorded: first, if a subject needed prompts on either of the first two steps of the subtest in order to begin, and second, where procedural errors would normally result in the rejection of a submitted document or form.

[1] No prompts were offered in the Cook's Job Sample Test since specifications for each step were available in cookbooks and manuals in the four subtests requiring sequential performance.

Table 4

Comparison of Three MOJ Groups on Job Sample Total Score

MOS	MOJ Group	N	Raw Mean	Adjusted Mean	Means on Adjusting Variables		Differences Between Means		
					AFQT	Education	1-9 MOJ vs. 10-24 MOJ	1-9 MOJ vs. 25+ MOJ	10-24 MOJ vs. 25+ MOJ
Armor Crewman	1- 9	107	166.1	167.3	37.2	11.2			
	10-24	128	236.6	235.7	39.9	11.1			
	25+	141	282.8	282.8	38.9	11.2			
		F=189.8, df=2 and 371, $p<.01$					Sig.	Sig.	Sig.
Repairman	1- 9	160	105.7	106.0	38.1	11.0			
	10-24	146	121.4	121.2	39.2	11.2			
	25+	81	141.8	141.7	38.9	10.9			
		F=41.4, df=2 and 382, $p<.01$					Sig.	Sig.	Sig.
Supply Specialist	1- 9	191	84.1	84.2	39.2	11.6			
	10-24	112	94.0	93.1	41.9	11.7			
	25+	93	109.3	110.1	38.1	11.4			
		F=51.5, df=2 and 391, $p<.01$					Sig.	Sig.	Sig.
Cook	1- 9	237	87.1	87.3	36.5	11.3			
	10-24	81	94.4	94.0	38.1	11.5			
	25+	48	112.6	112.2	38.7	11.3			
		F=36.6, df=2 and 361, $p<.01$					NS	Sig.	Sig.

Analysis of both of the above types of qualitative information pertains directly to the question of whether men at lower ability levels require more of a supervisor's or co-worker's time to assist them in their jobs. While prompt scores are related to total test performance in that points could only be earned for steps where prompts were not necessary, and points could not be earned beyond the step where a subtest was terminated, analysis of prompt and critical error scores supplements information about total test scores by adding information of a more absolute nature about job performance.

Figures 16 and 17 (Tables A-12, A-13 in Appendix A) show the average percent of subtests completed with little or no assistance for Armor Crewman and Repairman respectively. As with total Job Sample Test scores, the ability to work independently is closely related to AFQT level and MOJ.

Figures 18 and 19 (Tables A-14, A-15 in Appendix A) show the average percent of Armor Crewman and Repairman subtests on which excessive prompting led to termination of the test. Not unexpectedly, the likelihood of a man's completion of a problem is related to his AFQT level and job experience.

Figure 20 (Table A-16 in Appendix A) shows the average percent of critical errors committed by Supply Specialists. As with each of the foregoing measures of effectiveness, the probability either of requiring an initial prompt or of committting a critical error is related to both AFQT and MOJ.

Armor Crewman: Mean Percent of Subtests Completed with No Prompts or One Prompt *(14 Subtests)*

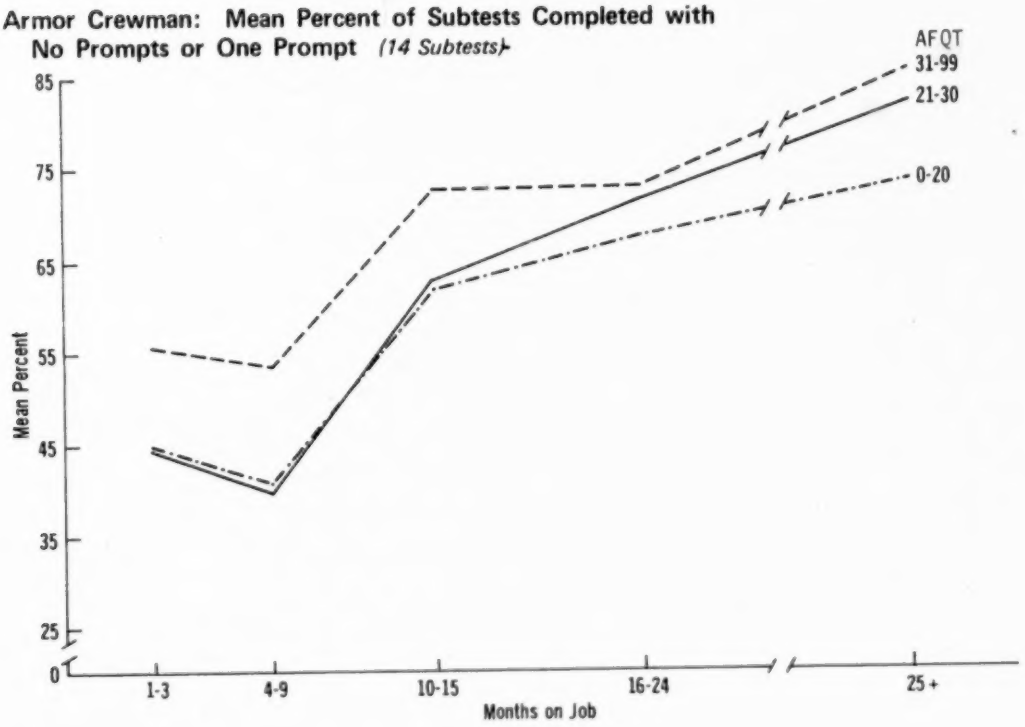

Figure 16

Repairman: Mean Percent of Subtests Completed with No Prompts or One Prompt *(13 Subtests)*

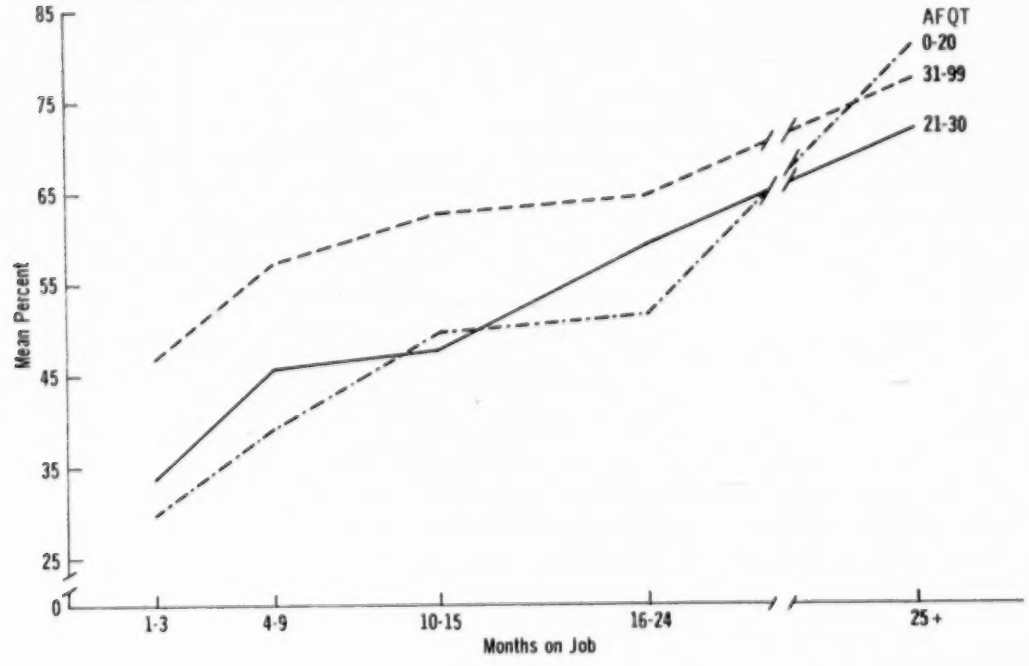

Figure 17

Armor Crewman: Mean Percent of Subtests Not Completed

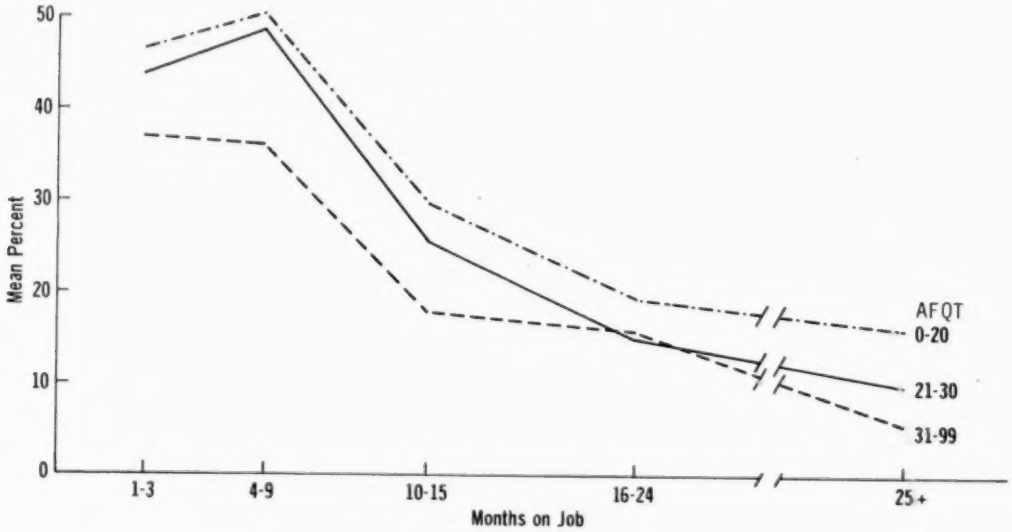

Figure 18

Repairman: Mean Percent of Subtests Not Completed

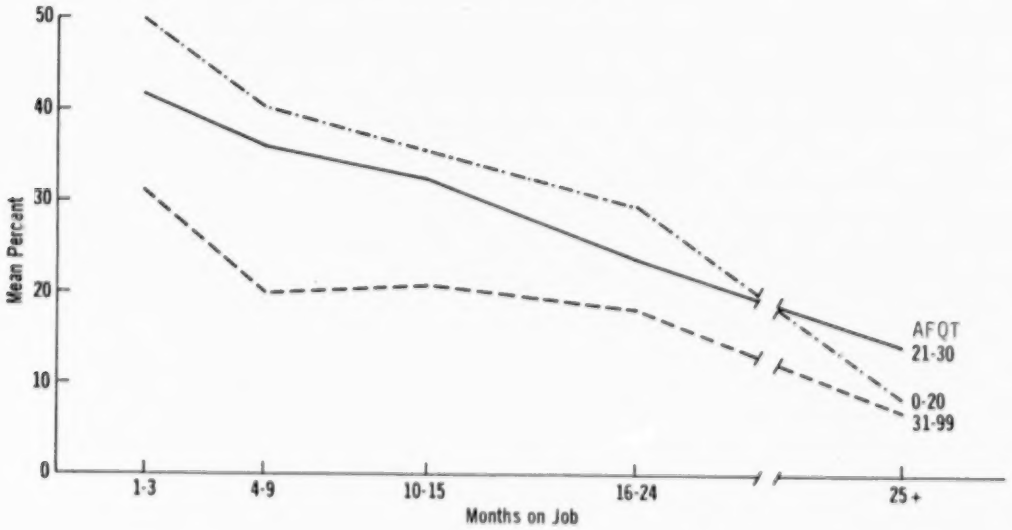

Figure 19

Supply Specialist: Mean Percent of Critical Errors

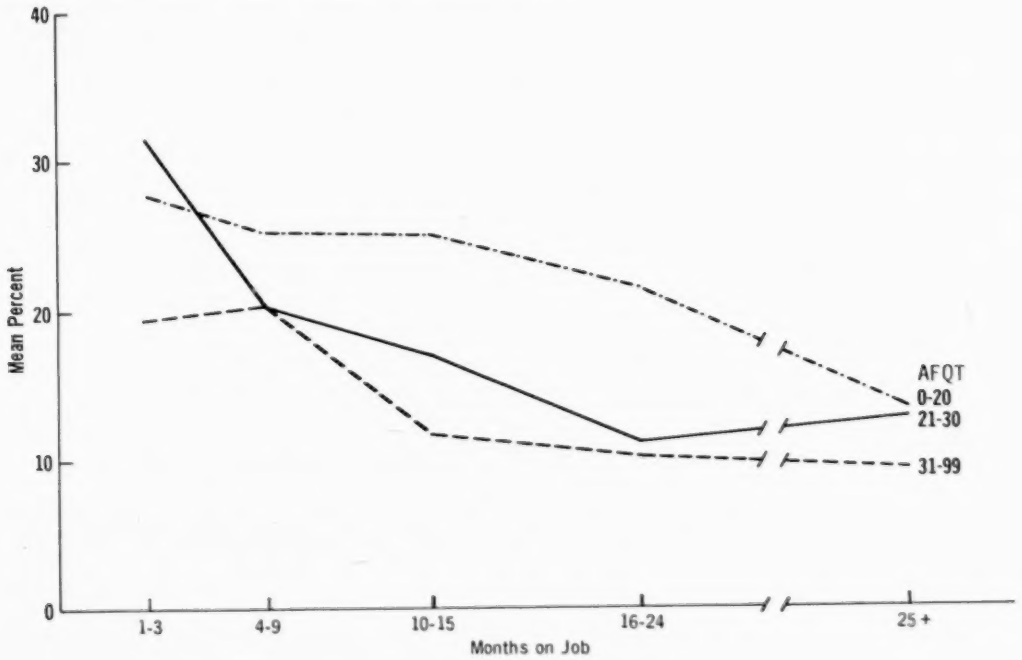

Figure 20

PERFORMANCE ON JOB KNOWLEDGE TESTS

Job performance depends not only upon a man's knowledge of what to do but also upon his ability to translate knowledge into action (skill) and his desire to do so (motivation). Thus, job knowledge is not perfectly related to job performance; yet information about a job is nearly always the most critical determinant of job behavior and tests of job knowledge usually provide the single most efficient predictor of performance. If job knowledge tests are to be used to estimate job proficiency, the reliability of these measures must also be considered.[1] Test reliabilities were computed as follows:

Group	Job Knowledge Test Reliabilities*	Estimated Job Sample Test Reliabilities (Lower Limit)**
Armor Crewman		
Category IV	.82	.52
Non-Category IV	.79	.55
Combined	.81	.55

[1] A fuller discussion of the relationship between job knowledge and job performance is contained in a later report of this series (3).

Group	Job Knowledge Test Reliabilities*	Estimated Job Sample Test Reliabilities (Lower Limit)**
Repairman		
Category IV	.76	.46
Non-Category IV	.77	.38
Combined	.76	.42
Supply Specialist		
Category IV	.94	.51
Non-Category IV	.89	.58
Combined	.92	.54
Cook		
Category IV	.82	.36
Non Category IV	.85	.34
Combined	.84	.35

*Correlations between odd- and even-numbered items; r corrected for test length.

**Lower limit estimated on the basis of correlations between job sample and job knowledge test scores and the reliabilities computed for the job knowledge test scores.

The high reliabilities obtained for the Job Knowledge tests are easily sufficient to permit the application of such tests to situations where group measurement is required. While Job Sample tests were used in this study as the primary measure of job effectiveness, multiple choice Job Knowledge tests were administered to provide a direct measure of a critical component of job performance. This section contains information about the results of that testing. As with the results of job sample testing, performance is examined as it varies according to AFQT level and months of job experience.

Scatter plots of individual Job Knowledge scores were found to be generally similar to scatter plots of Job Sample scores, presented in the previous section, and so are not presented here. Like the Job Sample tests, performance on the Job Knowledge tests was quite variable during the first 30 months of job experience. With additional experience there was a decrease in variability accompanied by a progressive increase in Job Knowledge scores. Finally, the overlap between the Category IV and Non-Category IV distributions, though slightly less complete, was again considerable.

Job Knowledge test scores for three different AFQT groups over six levels of time are shown in Figures 21-24 (Tables A-17—A-20 in Appendix A). The same data, regrouped according to three levels of job experience are plotted by five AFQT intervals in Figures 25-28 (Tables A-21—A-24 in Appendix A).

The relationship of Job Knowledge scores to AFQT and MOJ is much the same as that observed with the Job Sample data. Performance improves both as a function of increasing AFQT and increasing MOJ. For Job Knowledge measures there is perfect separation between groups constituted on the basis of MOJ. For AFQT groups there is some overlap at scattered points along the time dimension. Unlike the Job Sample tests, however, there is only slight evidence of convergence (except in the Supply Specialist) beyond five years. Although a considerable amount of the information required in Job Knowledge tests is necessary in the performance of a job, it need not be memorized because it is available in manuals and other job supports. Nevertheless, incidental learning of this material takes place. Acquisition of such information occurs over a span of time

Armor Crewman's Job Knowledge Score by Time on Job for AFQT Groups

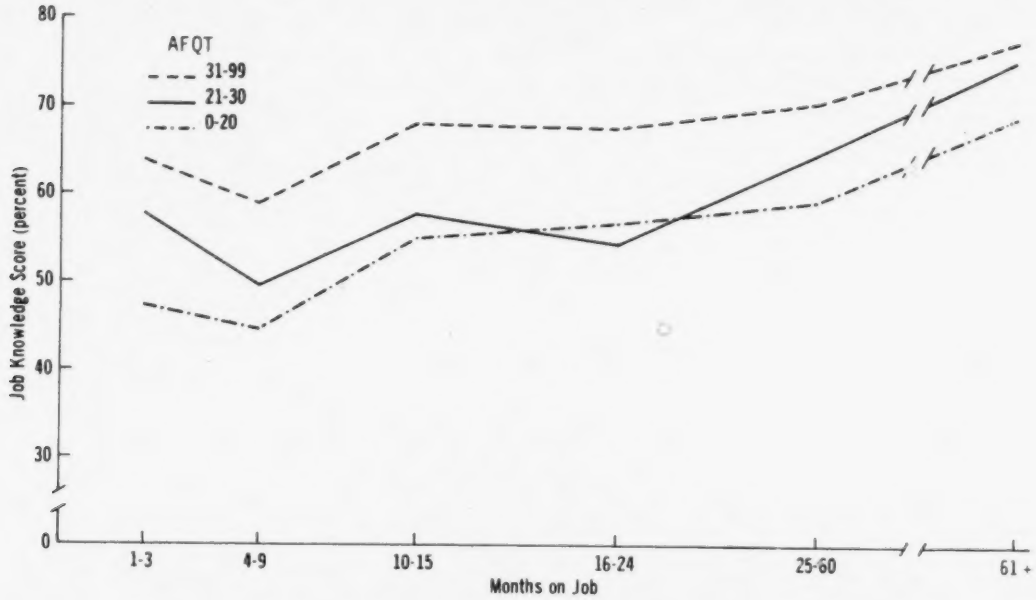

Figure 21

Repairman's Job Knowledge Score by Time on Job for AFQT Groups

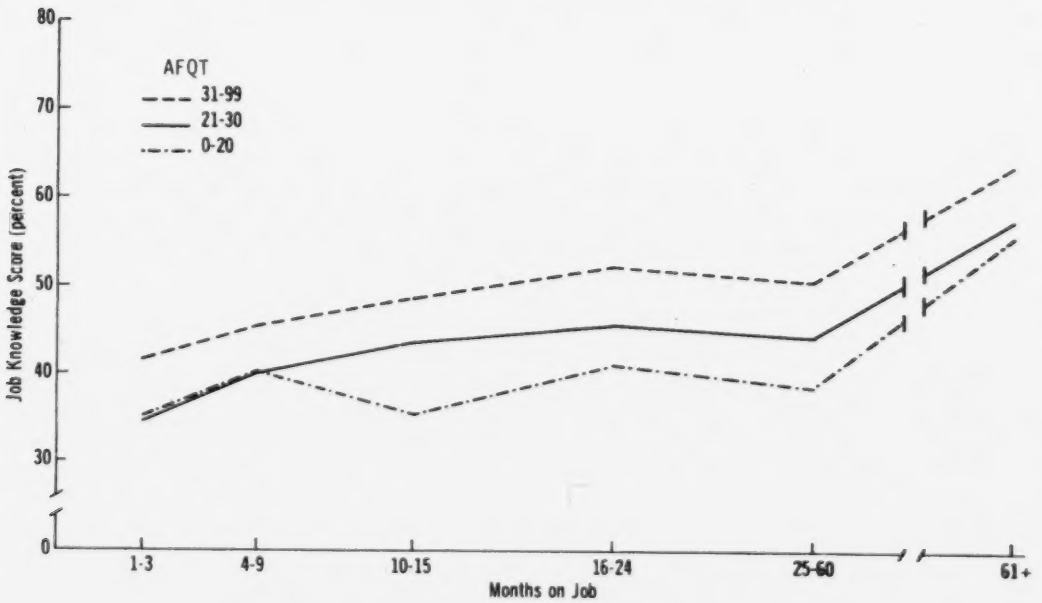

Figure 22

Supply Specialist's Job Knowledge Score by Time on Job for AFQT Groups

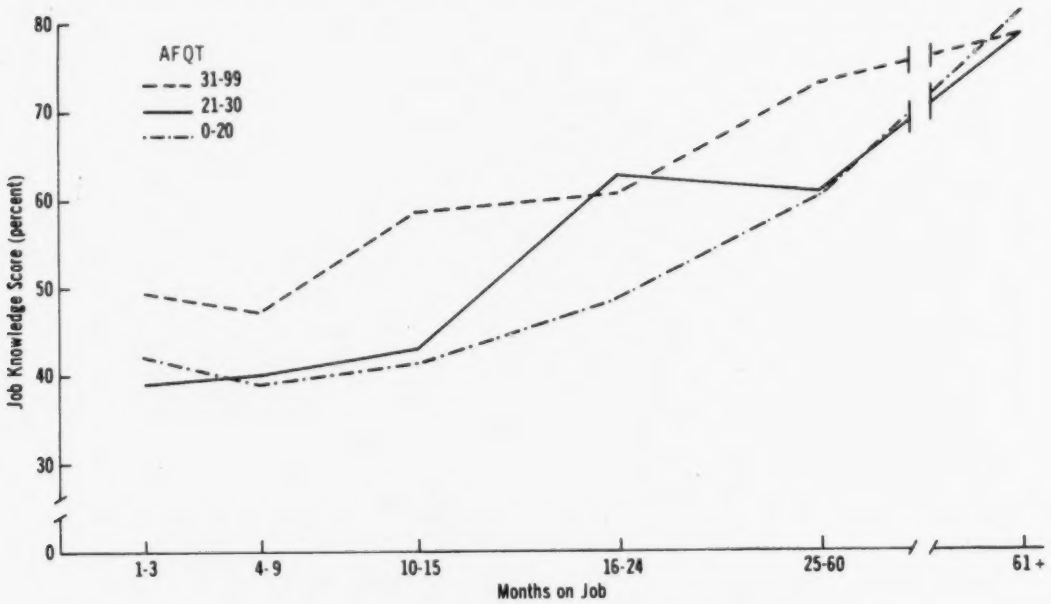

Figure 23

Cook's Job Knowledge Score by Time on Job for AFQT Groups

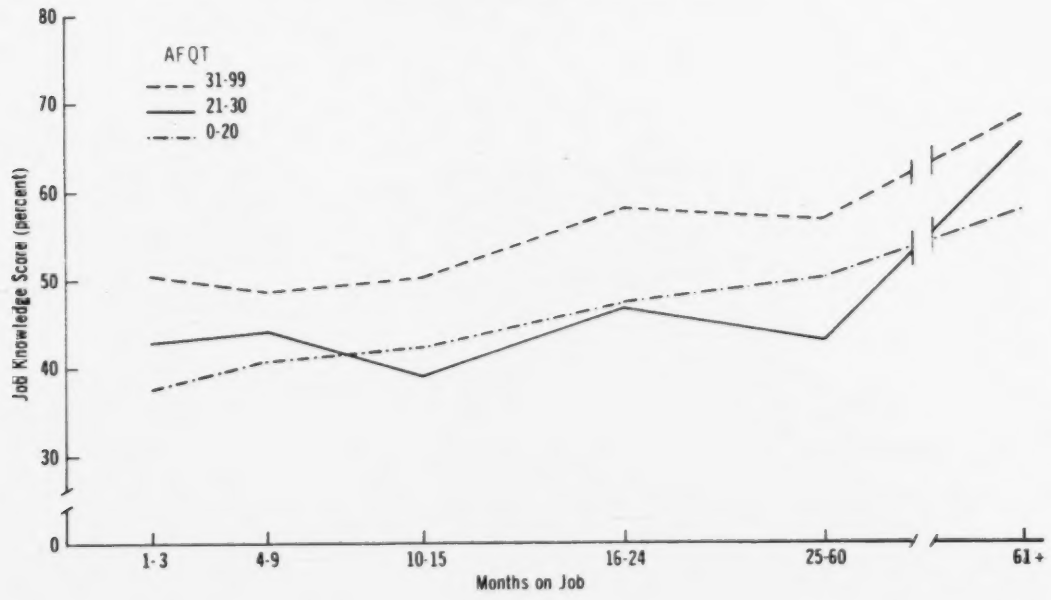

Figure 24

Armor Crewman's Job Knowledge Score by AFQT for Time on Job Groups

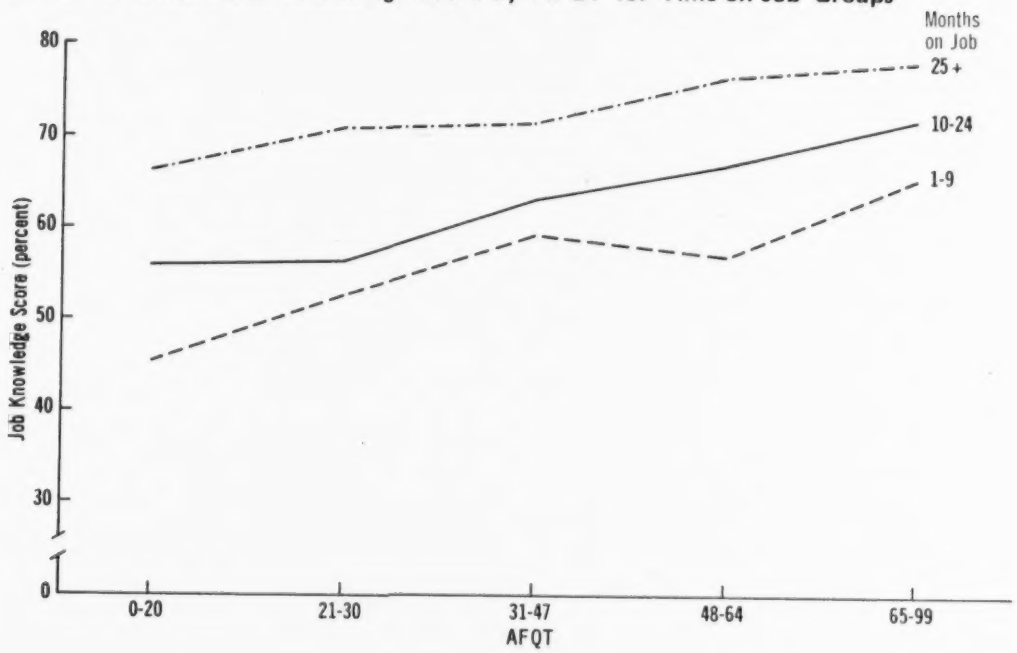

Figure 25

Repairman's Job Knowledge Score by AFQT for Time on Job Groups

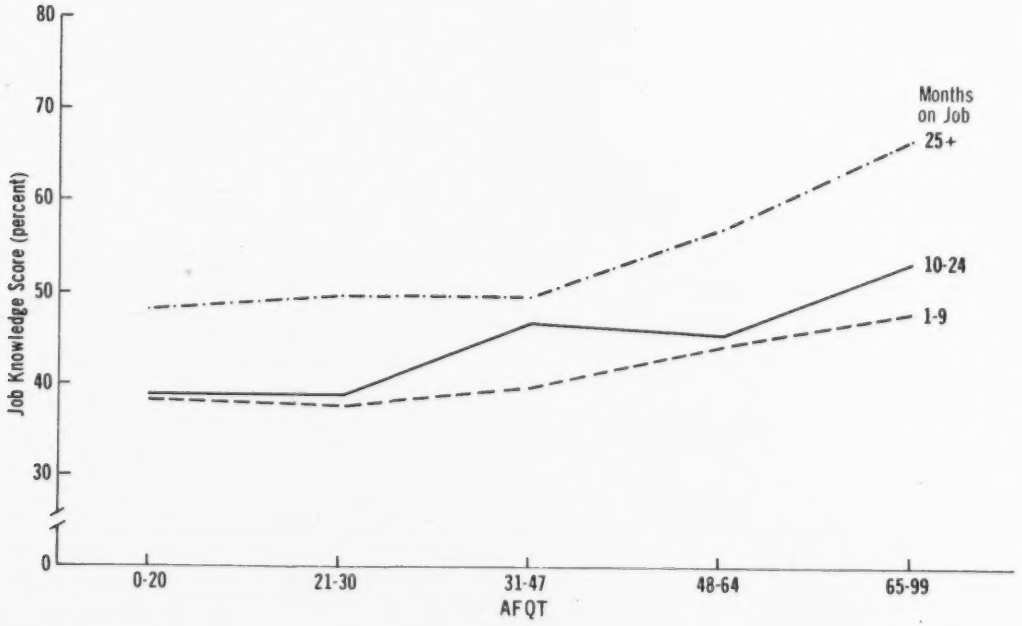

Figure 26

Supply Specialist's Job Knowledge Score by AFQT for Time on Job Groups

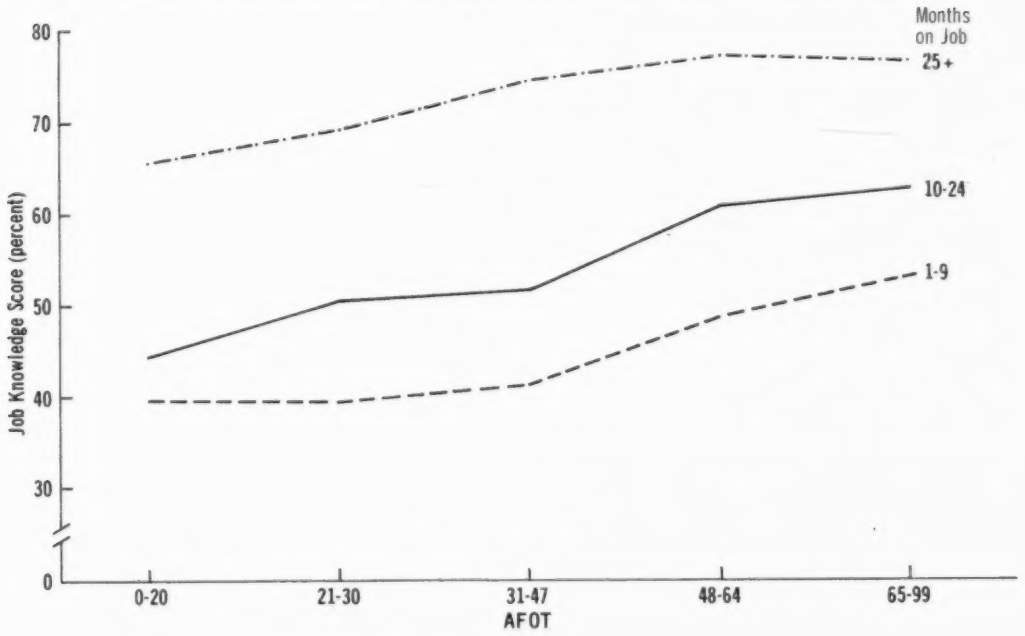

Figure 27

Cook's Job Knowledge Score by AFQT for Time on Job Groups

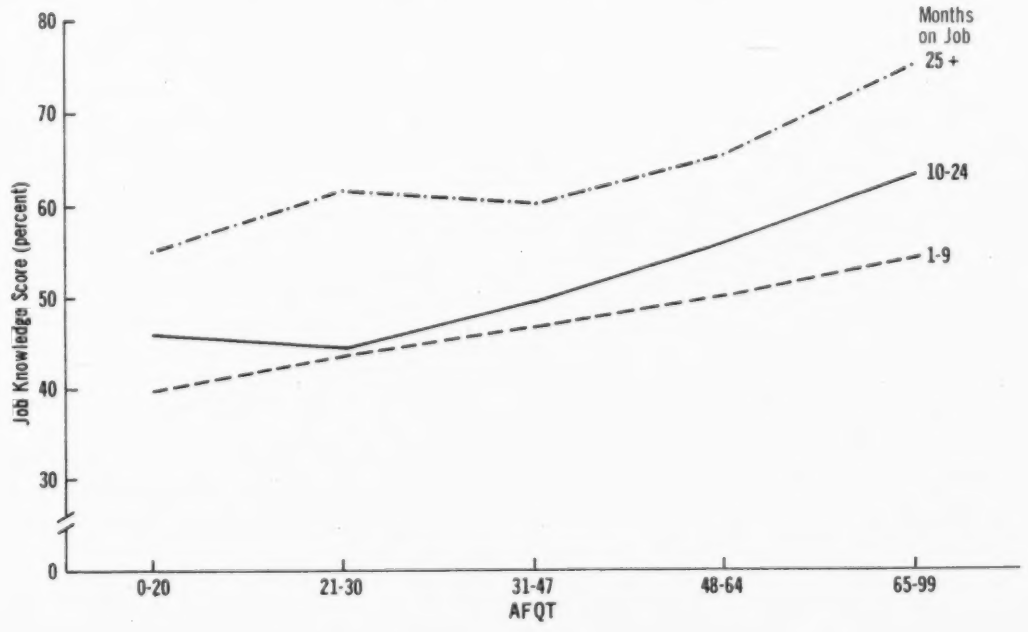

Figure 28

and it is not unreasonable that separation between curves, descriptive of this process, be maintained.

As with Job Sample scores, Job Knowledge scores have been sorted into quarters for the 1-18 month group. The distribution for each AFQT level of the Job Knowledge scores is displayed in Figure 29 (Table A-25 in Appendix A).

Distribution of AFQT Groups With 1-18 Months-on-Job on Job Knowledge Tests *(Four MOSs Combined)*

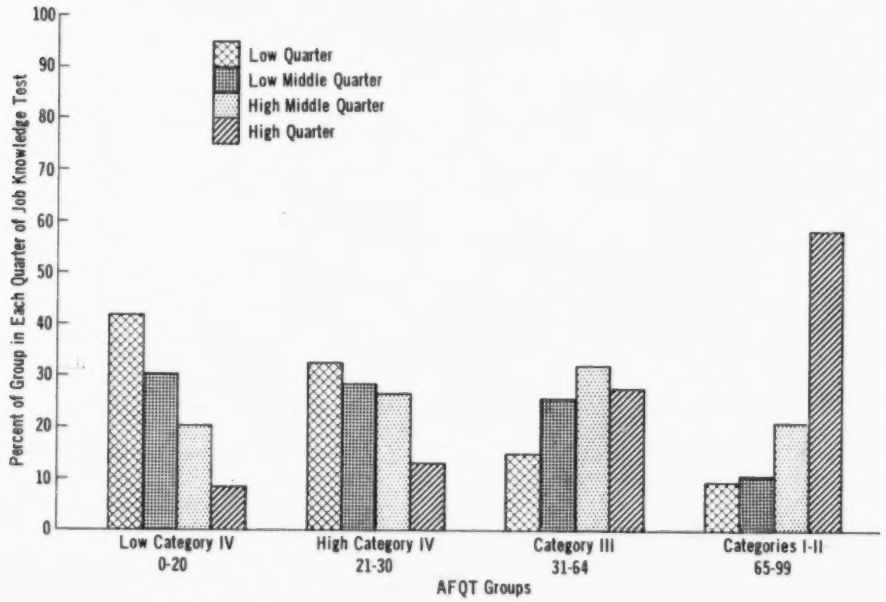

Figure 29

The distributions obtained on the 1-18 month group have been used to sort subjects in the 19-30 MOJ and 31+ MOJ groups as shown in Figures 30 and 31 (Tables A-26, A-27 in Appendix A).

Job Knowledge scores are somewhat more closely related to AFQT than were Job Sample scores. Over time, AFQT groups remain more differentiated. Thus, beyond 30 months on the job all men in Category I-II fall above the upper Job Knowledge quarter. Nevertheless, there is substantial representation of even the lowest AFQT group in the upper half of the distribution at each time interval. During the first 18 months, 29% of the 0-20 AFQT group fall in the upper half of the distribution; between 19 and 30 MOJ, 55% of this group fall in the upper half; and beyond 30 MOJ, this figure rises to 82%.

Correlations between Job Knowledge scores, AFQT, education, MOJ, and age are presented in Table 5.

As with the Job Sample test, the zero-order correlations for each of the predictors with the criterion show a moderate relationship for AFQT and age, a negligible relationship for education, and consistently, the highest relationship between MOJ and Job Knowledge.

Examination of the partial $\underline{r}$s indicates that (a) just as with Job Sample tests, MOJ is more highly related to the criterion than AFQT, and (b) in general, a stronger relationship is observed between AFQT and Job Knowledge score than was seen between AFQT and Job Sample score. The stronger relationship between AFQT and Job Knowledge is

Distribution of AFQT Groups With 19-30 Months-on-Job on Job Knowledge Tests *(Four MOSs Combined—in Relation to Quarters of 1-18 MOJ Subsample)*

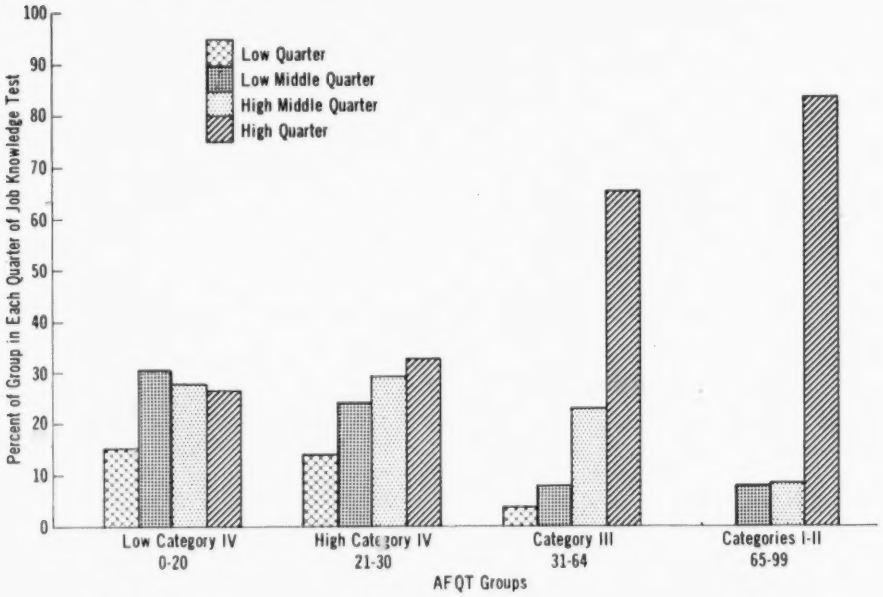

Figure 30

Distribution of AFQT Groups With 31+ Months-on-Job on Job Knowledge Tests *(Four MOSs Combined—in Relation to Quarters of 1-18 MOJ Subsample)*

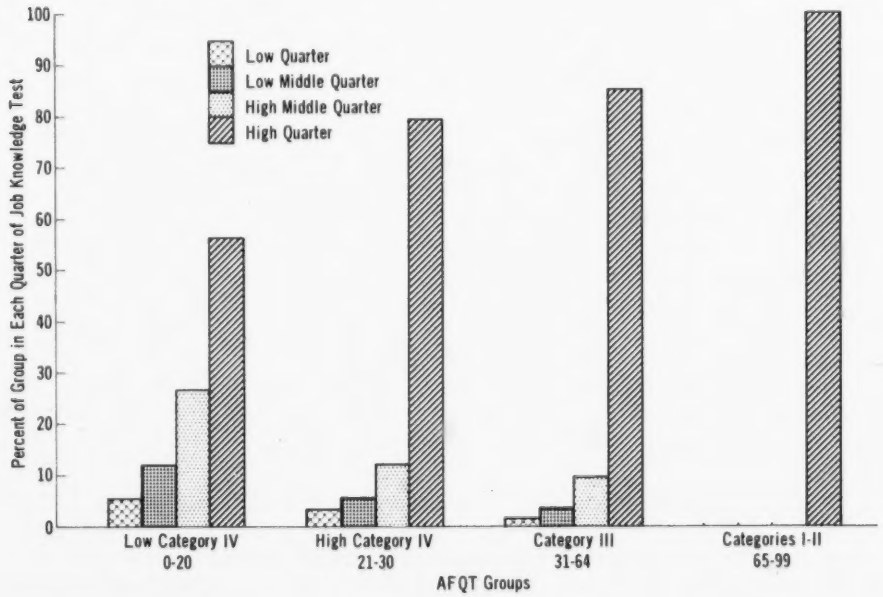

Figure 31

Table 5

Multiple Correlations (R) for Two Variables With Job Knowledge (Zero-Order Correlations for Four Variables[a])

MOS	Variable	Job Knowledge	
		Partial Correlation and *R*	Zero-Order Correlation
Armor Crewman	AFQT	.54*	.46*
	Education		.14*
	MOJ	.61*	.55*
	Age		.42*
		R=.71	
		$p<.01$	
Repairman	AFQT	.42*	.39*
	Education		.01
	MOJ	.48*	.45*
	Age		.32*
		R=.59	
		$p<.01$	
Supply Specialist	AFQT	.37*	.29*
	Education		.12*
	MOJ	.66*	.63*
	Age		.49*
		R=.70	
		$p<.01$	
Cook	AFQT	.47*	.43*
	Education		.15*
	MOJ	.50*	.46*
	Age		.45*
		R=.62	
		$p<.01$	

[a] *Indicates statistical significance ($p<.05$).

not surprising since both the AFQT and multiple choice paper-and-pencil tests possess strong verbal components. One of the subtests of the AFQT measures verbal ability using multiple choice vocabulary items. Another, the arithmetic subtest presents problems in the form of verbal statements. Scores on Job Knowledge tests are highly related to reading ability (5). Thus, scores on either test are dependent upon a man's language skills and at least a moderate correlation between them is inevitable.

The independent effects of AFQT and MOJ on mean Job Knowledge scores are shown in Tables 6 and 7. As with the Job Sample data, where AFQT is the independent variable, the contributions of MOJ and age have been statistically controlled. Where MOJ is the independent variable, the contributions of AFQT and education have been statistically controlled.

Table 6

Comparison of Three AFQT Groups on Job Knowledge Score

MOS	AFQT Group	N	Raw Mean	Adjusted Mean	Means on Adjusting Variables		Differences Between Means		
					MOJ	Age	Low IV vs. High IV	Low IV vs. Non-IV	High IV vs. Non-IV
Armor Crewman	0-20	97	41.2	42.0	29.6	23.5			
	21-30	92	46.9	46.0	23.2	25.4			
	31-99	187	51.4	51.4	38.5	23.8			
		F=55.6, df=2 and 371, $p<.05$					Sig.	Sig.	Sig.
Repairman	0-20	91	34.3	35.2	16.3	22.8			
	21-30	103	38.4	37.4	28.1	23.2			
	31-99	193	42.9	43.0	23.2	22.5			
		F=31.0, df=2 and 382, $p<.05$					NS	Sig.	Sig.
Supply Specialist	0-20	100	43.1	45.5	15.4	24.2			
	21-30	98	50.2	48.1	34.2	25.2			
	31-99	198	55.2	55.0	24.3	24.8			
		F=23.0, df=2 and 391, $p<.05$					NS	Sig.	Sig.
Cook	0-20	106	31.9	32.5	14.3	22.0			
	21-30	78	36.2	35.3	23.1	23.2			
	31-99	182	39.8	39.8	23.9	22.6			
		F=32.5, df=2 and 361, $p<.05$					Sig.	Sig.	Sig.

Again, the primary result of the adjustment where AFQT is the independent variable is to raise the mean slightly for the 0-20 AFQT group.

Examination of the adjusted Job Knowledge means shows that in each MOS there is a consistent difference among AFQT groups (F tests). Specific tests of differences between means indicate that all but two comparisons are reliably different. When comparisons are made between Low Category IVs and High Category IVs in Repairman and Supply MOSs, Job Knowledge means are not found to be reliably different.

Comparison of Job Knowledge means where AFQT and education have been controlled shows consistent differences attributable to MOJ, as shown in Table 7 (F tests). Specific tests of differences between means show all differences to be reliable except for Repairman.

As in the Job Sample tests, comparisons of the means in these tables and of the graphs representing each variable (Figures 18-21 for AFQT and Figures 22-25 for MOJ) show the absolute differences in performance associated with MOJ to be greater than differences associated with AFQT.

ORDERING OF CORRELATIONS FOR COMBINED MOSs

To summarize the relationships of AFQT and MOJ, each with the two criterion measures, the partial correlations for like-combinations of these variables have been

Table 7

Comparison of Three MOJ Groups on Job Knowledge Score

MOS	MOJ Group	N	Raw Mean	Adjusted Mean	Means on Adjusting Variables		Difference Between Means		
					AFQT	Education	1-9 mos. vs. 10-24 mos.	1-9 mos. vs. 25+ mos.	10-24 mos. vs. 25+ mos.
Armor Crewman	1- 9	107	40.6	40.9	37.2	11.2			
	10-24	128	46.4	46.2	39.9	11.1			
	25+	141	54.1	54.1	38.9	11.2			
		F=111.7, df=2 and 371, $p<.01$					Sig.	Sig.	Sig.
Repairman	1- 9	160	35.7	35.8	38.1	11.0			
	10-24	146	40.4	40.4	39.2	11.2			
	25+	81	46.1	46.1	38.9	10.9			
		F=39.2, df=2 and 382, $p<.01$					NS	Sig.	NS
Supply Specialist	1- 9	191	41.9	41.9	39.2	11.6			
	10-24	112	51.3	50.7	41.9	11.7			
	25+	93	69.0	69.6	38.1	11.4			
		F=147.0, df=2 and 391, $p<.01$					Sig.	Sig.	Sig.
Cook	1- 9	237	34.2	34.3	36.5	11.3			
	10-24	81	37.8	37.6	38.1	11.5			
	25+	48	47.7	47.5	38.7	11.3			
		F=66.2, df=2 and 361, $p<.01$					Sig.	Sig.	Sig.

averaged across MOSs. Individual partial rs were converted to z scores (weighted by their own Ns) and the average partial correlation obtained. Table 8 contains these correlations in order of their magnitude.

Table 8

Partial[a] Correlations Averaged for Four MOSs (Controlling for AFQT and MOJ)

Variable	Criterion	Partial Correlation
MOJ[a]	Job Knowledge	.56
MOJ[a]	Job Sample	.50
AFQT[b]	Job Knowledge	.45
AFQT[b]	Job Sample	.35

[a]Correlations with MOJ have been obtained with AFQT partialled out.

[b]Correlations with AFQT have been obtained with MOJ partialled out.

The ordering of these correlations shows that the amount of job experience a man has (MOJ) is more highly related than his AFQT to both the amount of information he possesses about his job (Job Knowledge score) and his level of job proficiency (Job Sample score). It is also clear that the amount of information a man possesses about his job is more accurately estimated than his performance of that job. (Correlations with Job Knowledge score are higher than corresponding correlations with Job Sample score.)

The lower predictability of Job Sample score is at least partly attributable to the greater complexity of this variable. A variety of factors interact to determine job performance, including aptitude, job skill, motivation, and job knowledge itself. Thus, Job Knowledge, in contrast, is more unitary in nature and therefore more predictable. As will be seen in a later section of this report devoted to comparisons of Negro and Caucasian performance, the relative ordering of these correlations is maintained in different ethnic groups. The implications of this differential ordering will be discussed in that section.

SUPERVISOR EVALUATIONS

A two-part rating instrument was administered to each subject's immediate supervisor to (a) provide information about a subject's effectiveness as viewed by supervisory personnel and (b) permit analysis of the relationships between supervisor ratings and performance as measured by Job Sample tests and Job Knowledge tests.[1] Part II of the Supervisor Questionnaire consisted of 14 rating scales taken directly from the Enlisted Efficiency Report used operationally by the Army (2). In this instrument, the higher the score the more favorable the rating. This section, paralleling the analyses of the Job Sample and Job Knowledge test data, examines the relationship between Supervisor Ratings and AFQT levels and months of job experience.

Figures 32-35 (Tables A-28—A-31 in Appendix A) display percent total score for Part II of the Supervisor Questionnaire for AFQT groups plotted by MOJ. Figures 36-39 (Tables A-32 through A-35 in Appendix A) display percent total score for MOJ groups plotted by AFQT.

In general the Supervisor Ratings are highly skewed, that is, the ratings all tend toward the favorable end of the scale regardless of AFQT level and MOJ. Also, the means show a less orderly pattern than either the Job Sample or Job Knowledge test scores.

Skewness and variability of this sort are not unusual with data obtained from summary rating instruments which typically are subject to a variety of methodological shortcomings: (a) They are highly subjective and susceptible to rater bias, halo effects, and selective recall. (b) They are dependent upon the familiarity of the rater with the ratee and his willingness to rate him. (c) Because they summarize performance over a whole period of work rather than evaluate specific acts, they tend to obscure differences in technical proficiency; behavior is generally described in global terms. (d) They commonly provide information only about the relative standing of individuals rather than an absolute appraisal of their effectiveness.

When drawn for different AFQT groups, the variability in the means for each point plotted obscures any clear differences between groups (Figures 32-35). The graphs for MOJ show a distinct separation for men with 25 or more months on the job (Figures 36-39). No differences are evident in the ratings of men with less than nine months on the job and those between 10 and 24 months.

[1] The data obtained with Part I of the Supervisor Questionnaire are not reported. Mean ratings obtained with this part of the instrument were so random when grouped by AFQT and MOJ levels that further consideration is not warranted.

Armor Crewman's Supervisor Questionnaire (Part II) by Time on Job for AFQT Groups

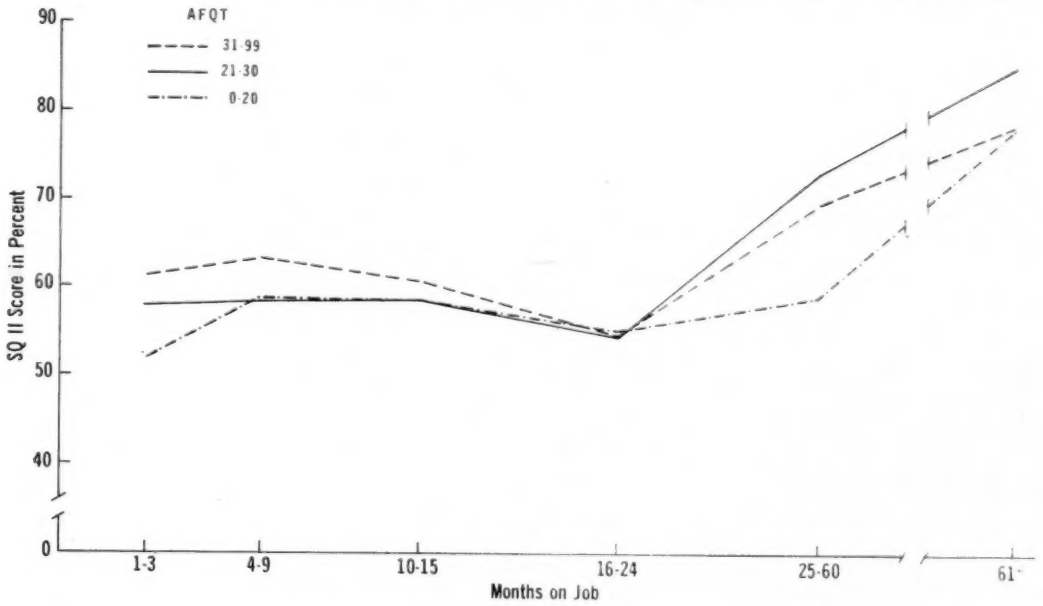

Figure 32

Repairman's Supervisor Questionnaire (Part II) by Time on Job for AFQT Groups

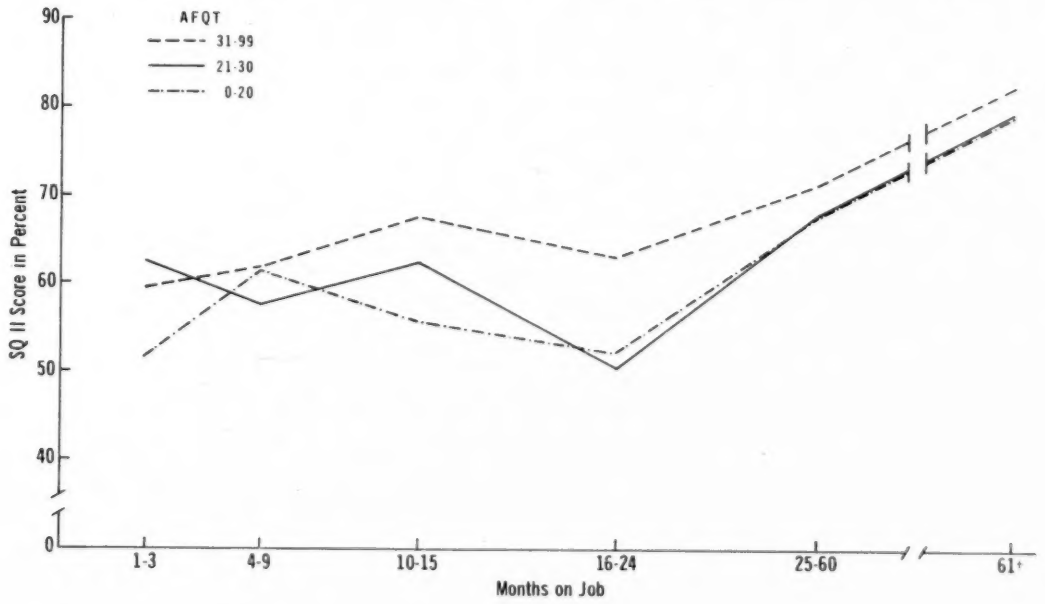

Figure 33

Supply Specialist's Supervisor Questionnaire (Part II) by Time on Job for AFQT Groups

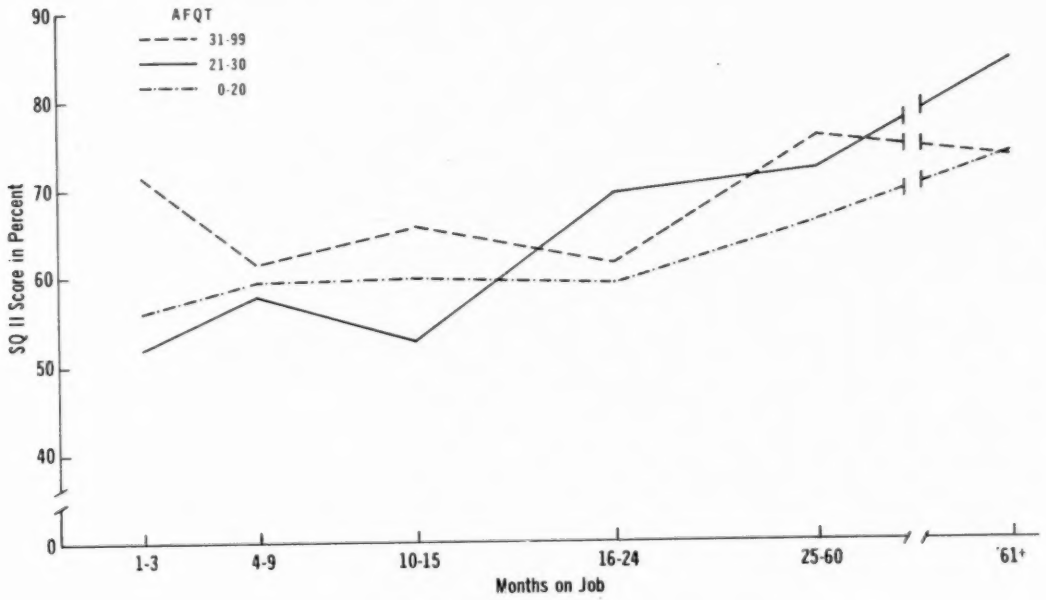

Figure 34

Cook's Supervisor Questionnaire (Part II) by Time on Job for AFQT Groups

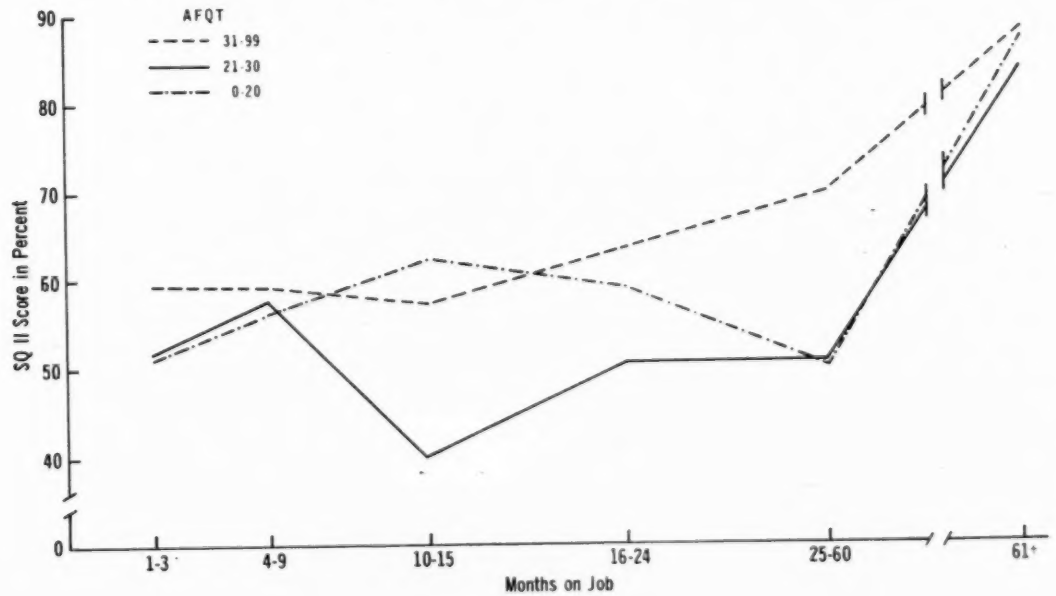

Figure 35

Armor Crewman's Questionnaire (Part II) by AFQT for Months-on-Job Groups

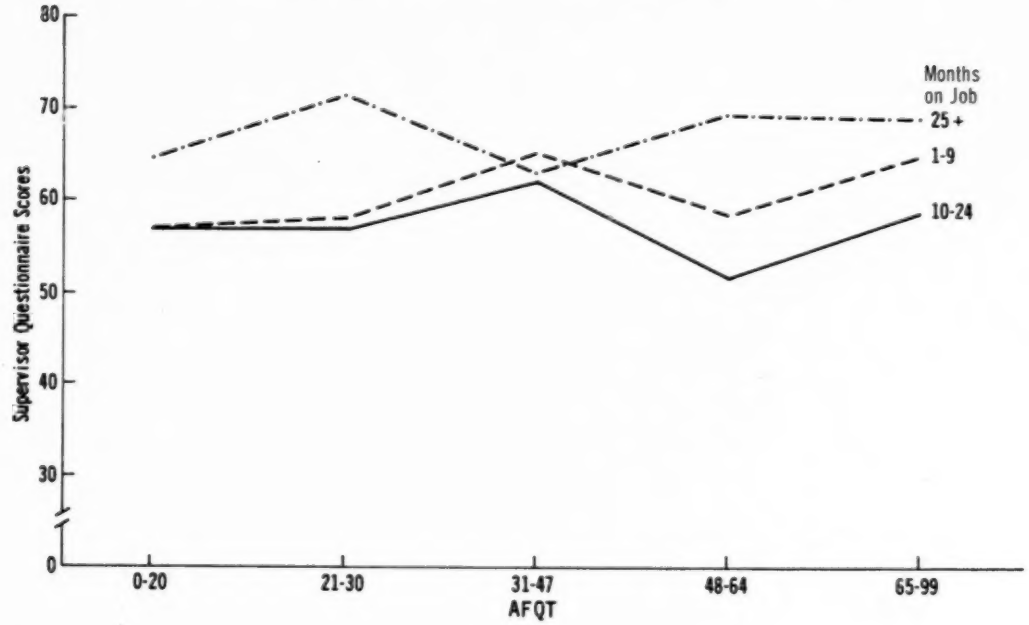

Figure 36

Repairman's Questionnaire (Part II) by AFQT for Months-on-Job Groups

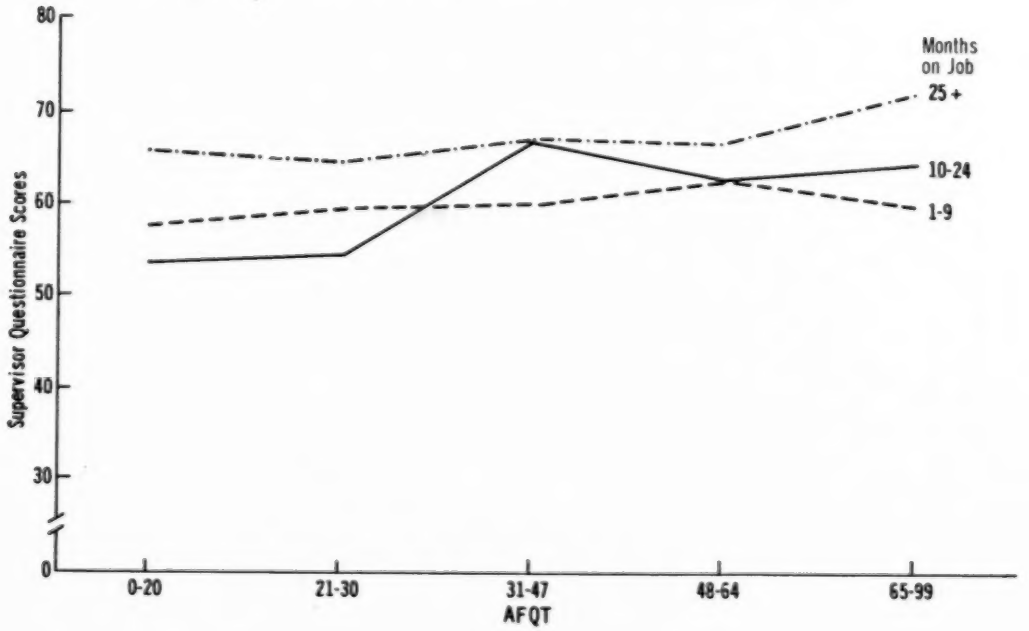

Figure 37

Supply Specialist's Questionnaire (Part II) by AFQT for Months-on-Job Groups

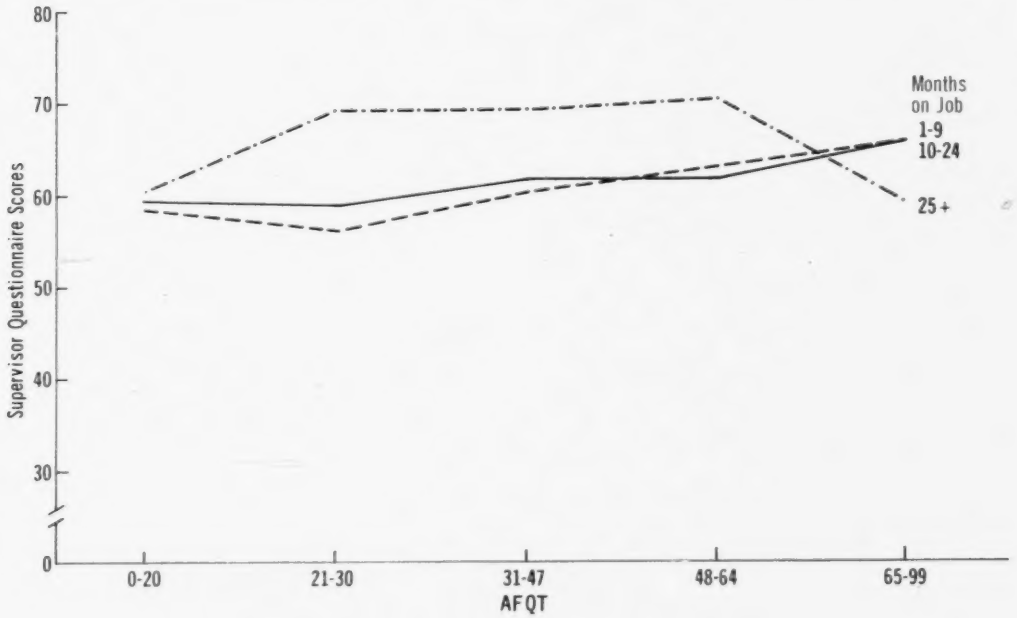

Figure 38

Cook's Questionnaire (Part II) by AFQT for Months-on-Job Groups

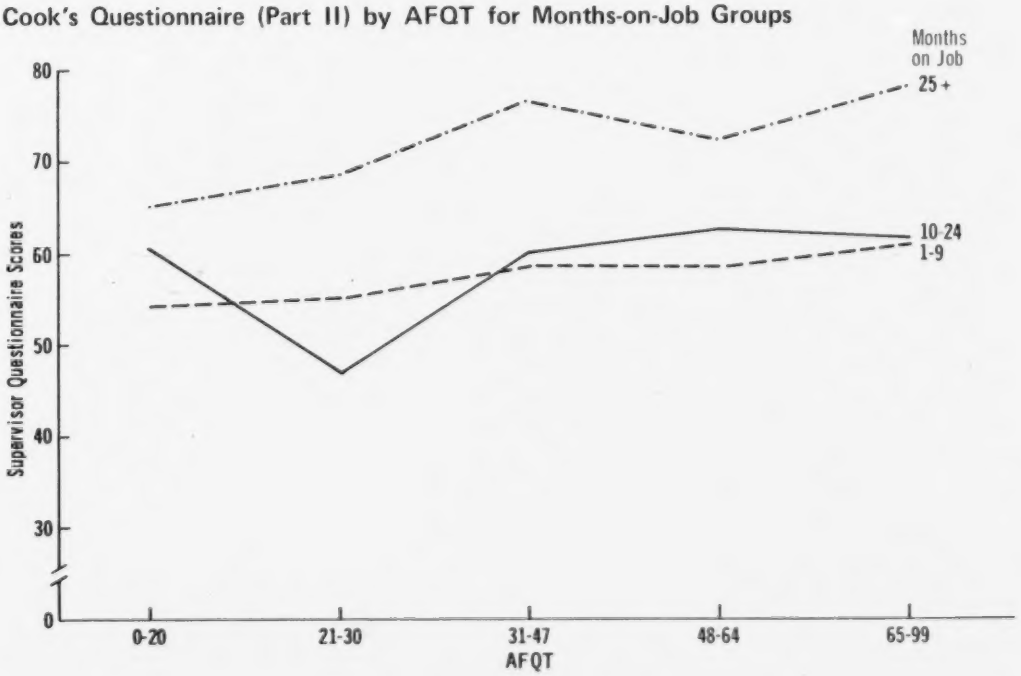

Figure 39

Correlations among the Supervisor Questionnaire, AFQT, education, MOJ, and age are presented in Table 9. Analyses of covariance showing the independent effects of AFQT and MOJ on the Supervisor ratings are given in Tables 10 and 11. These statistics reflect the general inadequacy of the Supervisor Rating instrument seen above. Partial correlations with AFQT and MOJ are quite low, as are the multiple correlations.

It is interesting to note that the highest correlations in the table are the zero-order correlations between age and Supervisor Rating. Where there is only a minimal relationship between ratings and MOJ, there is little reason to expect a correlation with age. The presence of a correlation, however, suggests that older men were rated higher because they were similar in age to the rater. This provides a likely example of the way in which bias can enter into ratings.

Table 9

Multiple Correlations (R) for Two Variables With Supervisor Ratings (Zero-Order Correlations for Four Variables[a])

MOS	Variable	Supervisor Rating	
		Partial Correlation and R	Zero-Order Correlation
Armor Crewman	AFQT	.06	.06
	Education		.02
	MOJ	.26*	.26*
	Age		.33*
		R=.27	
		p<.01	
Repairman	AFQT	.15*	.15*
	Education		.06
	MOJ	.15*	.15*
	Age		.24*
		R=.21	
		p<.01	
Supply Specialist	AFQT	.11*	.10*
	Education		.14*
	MOJ	.14*	.14*
	Age		.21*
		R=.18	
		p<.01	
Cook	AFQT	.15*	.15*
	Education		.09
	MOJ	.27*	.27*
	Age		.41*
		R=.30	
		p<.01	

[a]* Indicates statistical significance (p<.05).

Table 10

Comparisons of Three AFQT Groups on Supervisor Ratings

MOS	AFQT Group	N	Raw Mean	Adjusted Mean	Means on Adjusting Variables		Differences Between Means		
					MOJ	Age	Low IV vs. High IV	Low IV vs. Non-IV	High IV vs Non-IV
Armor Crewman	0-20	96	58.6	59.2	28.5	23.5			
	21-30	89	64.7	63.4	48.6	25.5			
	31-99	179	62.5	62.8	37.1	23.7			
			F=2.1, df=2 and 359, NS				--	--	--
Repairman	0-20	85	57.0	57.2	14.7	22.6			
	21-30	92	59.4	58.7	30.3	23.5			
	31-99	180	63.8	64.1	22.6	22.6			
			F=6.9, df=2 and 352, $p<.01$				NS	Sig.	Sig.
Supply Specialist	0-20	94	59.1	59.6	15.6	24.1			
	21-30	94	61.5	61.1	35.0	25.2			
	31-99	192	64.0	64.0	24.9	24.7			
			F=2.1, df=2 and 375, NS				--	--	--
Cook	0-20	106	56.6	57.2	14.5	22.0			
	21-30	77	56.4	55.7	33.3	23.2			
	31-99	175	62.0	61.9	22.1	22.6			
			F=4.9, df=2 and 353, $p<.01$				NS	Sig.	Sig.

The analyses of covariance for different AFQT groups (Table 10) show that in two of the four MOSs, men at different AFQT levels are rated similarly. In Repairman and Cooks, ratings reliably differentiate between different levels. Tests of the differences between pairs of means in the latter two MOSs indicate that Category IVs are distinguished from Non-Category IVs, but that no differentiation is made within the Category IV group itself.

In each MOS, ratings differ reliably for men with varying amounts of job experience (Table 11). Tests of differences between pairs of means show that men with between 1 and 24 months of job experience are consistently rated lower than men with more than 24 months of job experience. As with Job Sample scores and Job Knowledge scores, MOJ is a more potent determinant of rated effectiveness than AFQT.

INTERRELATIONSHIPS AMONG CRITERION MEASURES

The intercorrelations among the criterion instruments used in the study indicate a high degree of relationship between Job Sample and Job Knowledge test scores, but a considerably lower degree of relationship between either of these criteria and Supervisor Ratings as Table 12 shows.

Table 11

Comparisons of Three MOJ Groups on Supervisor Ratings

MOS	MOJ Group	N	Raw Mean	Adjusted Mean	Difference Between Means		
					1-9 mos. vs. 10-24 mos.	1-9 mos. vs. 25+ mos.	10-24 mos. vs. 25+ mos.
Armor Crewman	1- 9	103	59.9	60.0			
	10-24	124	57.3	57.2			
	25+	137	67.9	67.9			
	F=15.9, df=2 and 359, $p<.01$				NS	Sig.	Sig.
Repairman	1- 9	149	59.7	59.8			
	10-24	130	59.4	59.4			
	25+	78	66.3	66.3			
	F=5.43, df=2 and 352, $p<.01$				NS	Sig.	Sig.
Supply Specialist	1- 9	182	60.4	60.2			
	10-24	109	61.6	61.3			
	25+	89	66.6	67.1			
	F=4.6, df=2 and 375, $p<.05$				NS	Sig.	Sig.
Cook	1- 9	232	57.3	57.4			
	10-24	80	57.7	57.5			
	25+	46	71.2	71.2			
	F=12.7, df=2 and 353, $p<.01$				NS	Sig.	Sig.

Table 12

Correlations of Job Sample, Job Knowledge, and Supervisor Ratings for the Entire Sample[a]

Measures	Armor Crewman	Repairman	Supply Specialist	Cook
	Zero-Order Correlations			
Job Sample-Job Knowledge	.68	.59	.72	.58
Job Sample-Supervisor Ratings	.27	.20	.28	.28
Job Knowledge-Supervisor Ratings	.31	.23	.32	.35
	Partial Correlations[b]			
Job Sample-Job Knowledge	.49	.49	.65	.50
Job Sample Supervisor Ratings	.13	.16	.24	.20
Job Knowledge-Supervisor Ratings	.21	.18	.29	.27

[a]All correlations are significantly different from zero ($p<.05$).

[b]Correlations have been obtained with MOJ partialled out.

The information a man has about a job, which is measured directly by Job Knowledge tests, is also a major determinant of his performance on Job Sample tests. This common element of job proficiency undoubtedly underlies the strong relationship between these two criteria.

The Supervisor Rating (Commander's Evaluation Report) attempts to measure a man's more general characteristics, such as his cooperativeness and reliability. Only two of its 14 scales deal directly with job performance or job knowledge. The low correlations of the Supervisor Rating with Job Sample and Job Knowledge are understandable in that the rating scales are intended to measure more global aspects of behavior.

The substantial correlations obtained in each MOS between Job Sample and Job Knowledge scores are examined for the Category IV and Non-Category IV groups individually in Table 13. It is of particular importance that for the restricted Category IV and Non-Category IV groups separately, the correlations remain highly similar to those of the entire sample as shown in Table 12.[1]

Table 13

Correlations of Job Sample and Job Knowledge for Category IV and Non-Category IV Subgroups[a]

Group	Partial Correlation[b]	Zero-Order Correlation
Armor Crewman		
Category IV	.34	.66
Non-Category IV	.49	.66
Repairman		
Category IV	.47	.59
Non-Category IV	.45	.54
Supply Specialist		
Category IV	.58	.69
Non-Category IV	.64	.72
Cook		
Category IV	.42	.54
Non-Category IV	.50	.54

[a]All correlations are significantly different from zero ($p<.05$).
[b]Correlations have been obtained with MOJ partialled out.

RELATIONSHIPS BETWEEN PERSONAL CHARACTERISTICS AND JOB SAMPLE AND JOB KNOWLEDGE SCORES

A total of 124 background and personal characteristics were examined in an attempt to identify characteristics that might be predictive of successful performance in the Category IV and Non-Category IV subsamples.

[1] A more complete discussion of the relationships among criteria will be found in a later report of this series (3).

In addition to aptitude and aptitude-area scores taken from a man's records, the study included a variety of measures such as a nonverbal test of intelligence, tests of carefulness and the ability to comprehend and follow oral directions, tests of memory for detail and digit span, tests of reading, arithmetic, and listening comprehension, and a checklist designed to measure a man's exposure to common middle-class experiences (akin to measures of socioeconomic level). A biographical questionnaire provided demographic data about a man's family, education, and premilitary history. Information was obtained about family cohesion, family mobility, and parental interest during a man's formative years. Also, information was obtained about work habits, experiences showing delinquent behavior, and conflict with authority.[1]

Of the 124 variables analyzed, only one predictor, the Listening test score,[2] was correlated appreciably with both Job Sample and Job Knowledge test scores. The correlations of the Listening test with Job Sample and Job Knowledge scores are presented in Table 14 for the entire sample and for the Category IV and Non-Category IV subsamples. For comparison, correlations of AFQT with the criteria are also given.

Table 14

Partial Correlations of Listening Test and AFQT Scores With Job Sample and Job Knowledge[a]

MOS	Total Sample		Category IVs		Non-Category IVs	
	Listening	AFQT	Listening	AFQT	Listening	AFQT
Job Sample						
Armor Crewman	.29*	.36*	.10	.11	.29*	.27*
Repairman	.38*	.32*	.36*	.12	.20*	.23*
Supply Specialist	.42*	.38*	.28*	.21*	.36*	.25*
Cook	.28*	.35*	.24*	.10	.22*	.20*
Job Knowledge						
Armor Crewman	.53*	.54*	.38*	.26*	.46*	.43*
Repairman	.40*	.42*	.31*	.10	.28*	.33*
Supply Specialist	.35*	.37*	.27*	.08	.22*	.31*
Cook	.39*	.47*	.31*	.13	.38*	.40*

[a]Correlations have been obtained with MOJ partialled out. *Indicates correlations significantly different from zero ($p<.05$).

The correlations of the Listening test score with each criterion for the entire sample are quite similar to those between AFQT and the criteria. However, when relationships are examined separately for Category IVs, the correlations between the Listening test score and the criteria are found to be somewhat higher than for AFQT. The lower relationship with AFQT may reflect the restriction of AFQT to scores 0-30.

The Listening test was designed to assess a man's comprehension and short-term recall of orally presented material. While it was included in the test battery as one of the measures of literacy skills, a man's score on the Listening test is also dependent upon his ability to maintain attention to, and remember, orally presented information, which is

[1] For a detailed description of background and personal characteristics variables see Reference 2.

[2] Developed as part of Work Unit REALISTIC (5).

transient (unlike most reading or cognitive tests) and which occurs at a rate of presentation not under control of the listener. In addition to these attention and forced-pace factors, the Listening test shares with AFQT a fair component of general language ability, as indicated by the correlation between these variables and reading (5).

For the full range of AFQT, the correlation of Listening with Job Sample provides no better prediction of performance than AFQT, and when AFQT and Listening are used in combination to predict Job Sample (Multiple Correlation), the gain in prediction is very small. However, the fact that Listening test scores are more highly related than AFQT to Job Sample scores for the restricted AFQT range of Category IV men suggests that the Listening test might be useful as an additional screening test for administration to Category IV men. This might permit further differentiation of successful and unsuccessful performers within the Mental Category IV group of men.

Several other predictors were found to be correlated with Job Knowledge score but not Job Sample score. The correlations of these variables with Job Knowledge scores are given in Table 15. While most of the correlations given in this table are fairly substantial, none of the relationships of these same variables with Job Sample shows sufficient strength and consistency across MOSs to be of any further interest.[1]

Table 15

Partial Correlations of Additional Variables Related to Job Knowledge for Category IV and Non-Category IV Subsamples[a]

Group	Army Classification Battery		Aptitude Area			Reading Grade Placement
	General Information	Mechanical Aptitude	Armor, Artillery, Engineering, Combat	Electronics	Motor Maintenance	
Armor Crewman						
Category IV	.24*	.39*	.24*	.31*	.29*	.34*
Non-Category IV	.31*	.33*	.38*	.38*	.29*	.49*
Repairman						
Category IV	.27*	.31*	.37*	.28*	.35*	.31*
Non-Category IV	.21*	.42*	.39*	.48*	.37*	.37*
Supply Specialist						
Category IV	.26*	−.03	.26*	.11	.05	.18*
Non-Category IV	.16*	.22*	.24*	.35*	.22*	.34*
Cook						
Category IV	.35*	.26*	.35*	.24*	.24*	.51*
Non-Category IV	.36*	.41*	.44*	.35*	.43*	.43*

[a]Asterisks denote correlations significantly different from zero.

[1] Exhaustive multiple regression analyses of background and personal characteristics variables both within MOS subgroups and across MOS failed to reveal generalizable prediction relationships of any utility. Individual variables that might appear to have some predictive value in one context invariably lost their power in another. The authors are indebted to Dr. John A. Plag for developing and carrying out the regression analyses. The procedure followed by Dr. Plag is summarized in Reference 6.

RELATION OF AFQT TO AN INDEX OF MISCONDUCT

The adequacy of a subject's job performance, as discussed in the previous section on primary criterion measures, was supplemented by information on misconduct taken from each man's permanent record. Entries of occurrences such as time lost for AWOL, reductions in rank, time lost for confinement, and courts martial were itemized, and a total count of each independent instance of misconduct recorded for the subject. While these data can be considered a gross index of general military suitability, a number of limitations reduce their generality and completeness:

(1) Army regulations prescribe that records of certain minor offenses be retained only temporarily in a man's file. Since such entries are removed either when a man leaves his unit or a new commanding officer takes command, the entries appearing in a man's record pertaining to such offenses were dependent on the length of time he had served under his commanding officer at the time of data collection.

(2) Some records were classified as temporary because the originals were lost. In such cases, information about prior offenses or punishments was not available.

(3) Of necessity, the study included only those men who were available for duty. Thus, any man confined to the stockade, or unavailable as a subject while awaiting judicial action, could not be included. This limitation considerably reduced the incidence of misconduct that was found. Also, it probably caused a disproportionate reduction in the number of serious offenses relative to minor offenses. These data, therefore, cannot provide information on the ratio of one type of offense to another.

Table 16

Distribution of Incidence of Misconduct
(Percent)

Instances of Misconduct	AFQT Level		
	0-20	21-30	31-99
Armor Crewman			
None	78	77	75
One	13	18	14
Two or more	8	4	11
Repairman			
None	84	87	92
One	7	8	4
Two or more	9	6	4
Supply Specialist			
None	88	88	84
One	8	6	11
Two or more	4	6	5
Cook			
None	87	92	93
One	9	3	3
Two or more	4	5	4
MOSs Combined			
None	84	86	86
One	9	9	8
Two or more	6	5	6

Table 17

Comparison of Three AFQT Groups on Incidence of Misconduct

MOS	AFQT Group	N	Raw Mean	Adjusted Mean
Armor Crewman	0-20	97	.53	.56
	21-30	92	.28	.24
	31-99	187	.43	.43
	F=2.0, df=2 and 371, NS			
Repairman	0-20	91	.36	.29
	21-30	103	.31	.29
	31-99	193	.18	.18
	F=.9, df=2 and 382, NS			
Supply Specialist	0-20	100	.23	.23
	21-30	98	.22	.23
	31-99	198	.28	.28
	F=.2, df=2 and 391, NS			
Cook	0-20	106	.18	.19
	21-30	78	.19	.18
	31-99	182	.13	.13
	F=.3, df=2 and 361, NS			

Table 16 shows the percentage of men at three AFQT levels for each MOS and the MOSs combined with no instances of misconduct, one instance of misconduct, and two or more instances.

The independent effect of AFQT within incidence of misconduct as the dependent variable is shown in Table 17 and that of MOJ in Table 18. The overall test (F) among AFQT levels was not significant in any of the MOSs.

Failure to find a relationship between AFQT and misconduct in this study is, of course, not conclusive. In research where misconduct is the main focus of attention and where all pertinent information is available (including men in confinement), differences associated with AFQT may be found.

The overall test (F) for MOJ levels showed significant differences in three MOSs (Armor Crewman, Repairman, and Cook), although for Cooks no reliable differences appeared between specific pairs of means. Despite the crudeness of this index, the general trend is as it should be. With increasing time in the job (and in the Army), for a fixed rate of misconduct, the cumulative number of occurrences of misconduct increases.

Multiple correlations between incidence of misconduct and AFQT and MOJ are given in Table 19. All relationships are either trivial or quite low.

In view of the limitations of this measure, particularly its insensitivity to the seriousness of the offense, misconduct was not considered further as a criterion measure in the study.

Table 18

Comparisons of Three MOJ Groups for Incidence of Misconduct

MOS	MOJ Group	N	Raw Mean	Adjusted Mean	Difference Between Means		
					1-9 mos. vs. 10-24 mos.	1-9 mos. vs. 25+ mos.	10-24 mos. vs. 25+ mos.
Armor Crewman	1- 9	107	.14	.15			
	10-24	128	.43	.42			
	25+	141	.62	.62			
	F=5.6, df=2 and 371, $p<.01$				NS	Sig.	NS
Repairman	1- 9	160	.11	.11			
	10-24	146	.27	.28			
	25+	81	.41	.39			
	F=4.0, df=2 and 382, $p<.05$				Sig.	Sig.	Sig.
Supply Specialist	1- 9	191	.24	.24			
	10-24	112	.18	.18			
	25+	93	.38	.38			
	F=1.4, df=2 and 391, NS				--	--	--
Cook	1- 9	237	.11	.10			
	10-24	81	.22	.23			
	25+	48	.31	.31			
	F=3.3, df=2 and 361, $p<.05$				NS	NS	NS

Table 19

Multiple Correlations (R) for Two Variables With Incidence of Misconduct (Zero-Order Correlations for Four Variables[a])

MOS	Variable	Incidence of Misconduct	
		Partial Correlation, and *R*	Zero-Order Correlation
Armor Crewman	AFQT	−.03	.03
	Education		−.17*
	MOJ	.19*	.19*
	Age		.18*
		R=.19	
		p<.01	
Repairman	AFQT	−.09	−.08
	Education		−.18*
	MOJ	.14*	.13*
	Age		.10*
		R=.16	
		p<.01	
Supply Specialist	AFQT	.01	.01
	Education		−.01
	MOJ	.02	.02
	Age		.10*
		R=.02	
		p=NS	
Cook	AFQT	−.08	−.07
	Education		−.12*
	MOJ	.10	.10
	Age		.07
		R=.13	
		p=NS	

[a]* Indicates statistical significance ($p<.05$).

PERFORMANCE ON JOB SAMPLE SUBTESTS

To provide a more detailed picture of the strengths and weaknesses of men in different mental ability groupings, the overall performance score on the Job Sample tests was divided into several part scores characterizing different aspects of total test performance. Subtests were examined individually and performance was analyzed as it varied according to the empirically determined difficulty level of each subtest. The frequency with which subtests are performed in the actual job situation was related to performance and problem difficulty. Finally, individual steps of subtests were classified according to the amount and kind of knowledge and type of behavior that a subject had to provide. Performance on classes of steps was then analyzed.

SUBTESTS ARRANGED BY ORDER OF DIFFICULTY

Mean percent scores on Job Sample subtests for men in Mental Groups I-III and IV are presented in Figures 40-43 (Tables A-36—A-39 in Appendix A) for each of the four MOSs. In each Figure, subtests are arranged from difficult to easy with difficulty defined in terms of the percent of maximum possible score obtained by IV and Non-Category IV groups combined.

The outstanding feature of these graphs is the consistently superior performance of men in Mental Groups I-III. The pattern remains unbroken across MOSs: On 20 out of 20 subtests for Armor Crewman, 13 out of 13 subtests for Repairman, 8 out of 8 subtests for Supply Specialists, and 5 out of 5 subtests for Cooks, the mean percent of points earned by men in Categories I-III is greater than that of men in Category IV. Further, these differences between Category IV and Non-Category IV groups occur on even the easiest subtests.

SETS OF SUBTESTS GROUPED ACCORDING TO DIFFICULTY

Although differences between Category IVs and Non-Category IVs occur on all subtests, there is some suggestion that differences between these groups may be greater on the more difficult subtests. To examine the manner in which performance varies according to AFQT level, job experience, and problem difficulty, scores of subtests of relatively equal difficulty were combined for three levels of difficulty.[1] Figures 44-47 (Tables A-40—A-43 in Appendix A) show performance on "easy," "medium," and "difficult" subtests for Category IV and Non-Category IV groups in each MOS.

Several observations can be made:

(1) Although the easy, medium, and difficult subsets were selected on the basis of combined sample performance without regard to time, in general the separation of pairs of curves representing varying levels of difficulty is maintained over time. Overlapping of curves of different difficulty levels occurs most frequently in Supply where the overall range of performance is most restricted. Of minor interest, in Supply the performance of Non-Category IVs on difficult problems is better than that of the Category IVs on medium problems.

(2) Almost without exception, Non-Category IVs are superior to Category IVs within the same difficulty level. Out of the 60 points where inversions in the performance of Category IVs and Non-Category IVs could occur, only two are observed—the 16-24 and 25+ MOJ points on the easy curves for Cooks.

(3) Not surprisingly, the separation between Category IV and Non-Category IV curves is least in the easy subsets. AFQT differences for medium and difficult subsets appear about the same. Evidence in the discussion of analysis of covariance, however, will show a clearer pattern of increasing separation between Category IVs and Non-Category IVs as a function of problem difficulty.

(4) Growth in performance occurs as a result of job experience in problems at each level of difficulty. Again, not surprisingly, the least change is seen in the easy subsets where performance on the job is almost immediately at a fairly high level. This is least true for Repairmen where the initial level of performance of the Category IV group is relatively low.

Correlations between AFQT, MOJ, and performance on subsets of varying difficulty are presented in Table 20.

[1] The subtests which were combined to form easy, medium, and difficult subsets are indicated in Table B-1 of Appendix B.

Armor Crewman's Job Sample Subtests Arranged According to Difficulty

(Mean Percent Score for Categories I-III and Category IV)

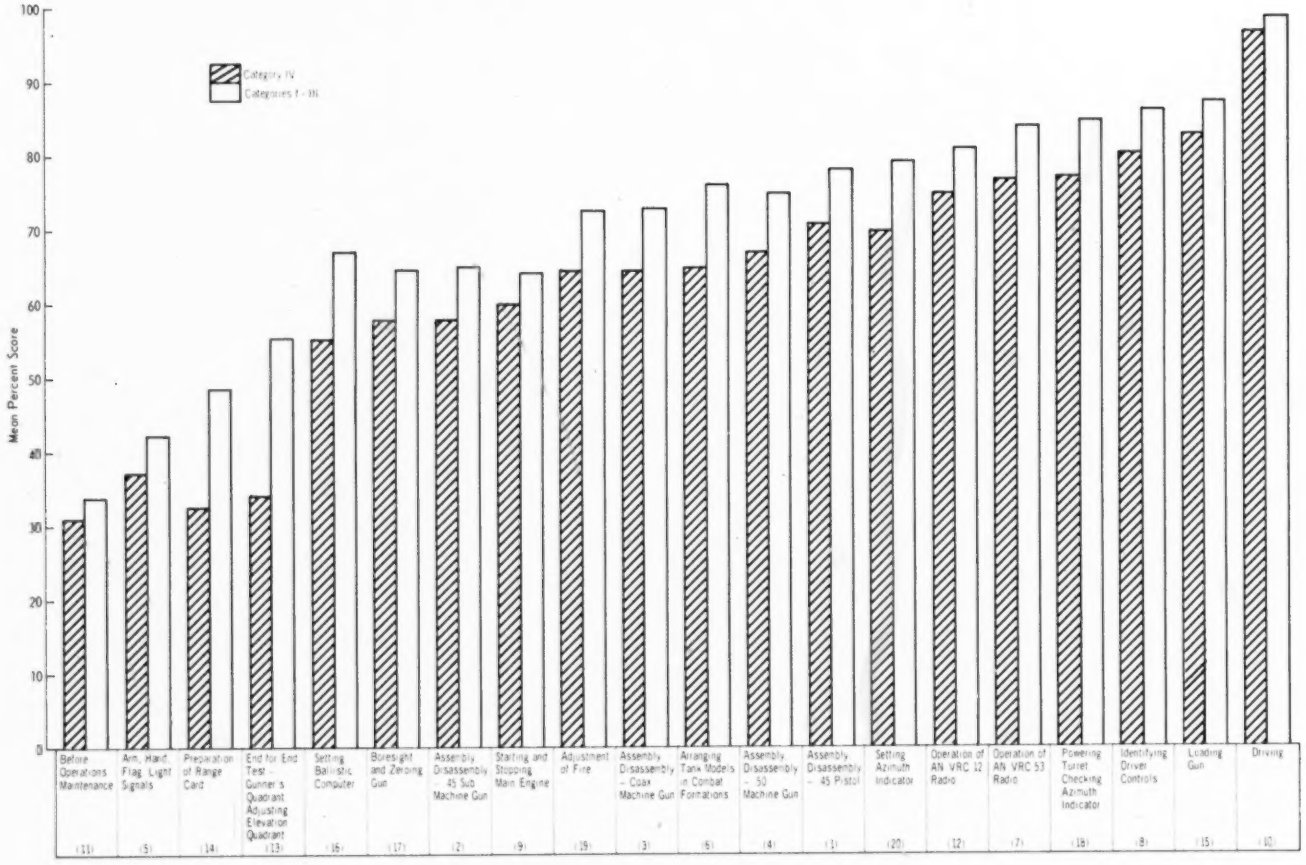

Figure 40

Repairman's Job Sample Subtests Arranged According to Difficulty

(Mean Percent Score for Categories I-III and Category IV)

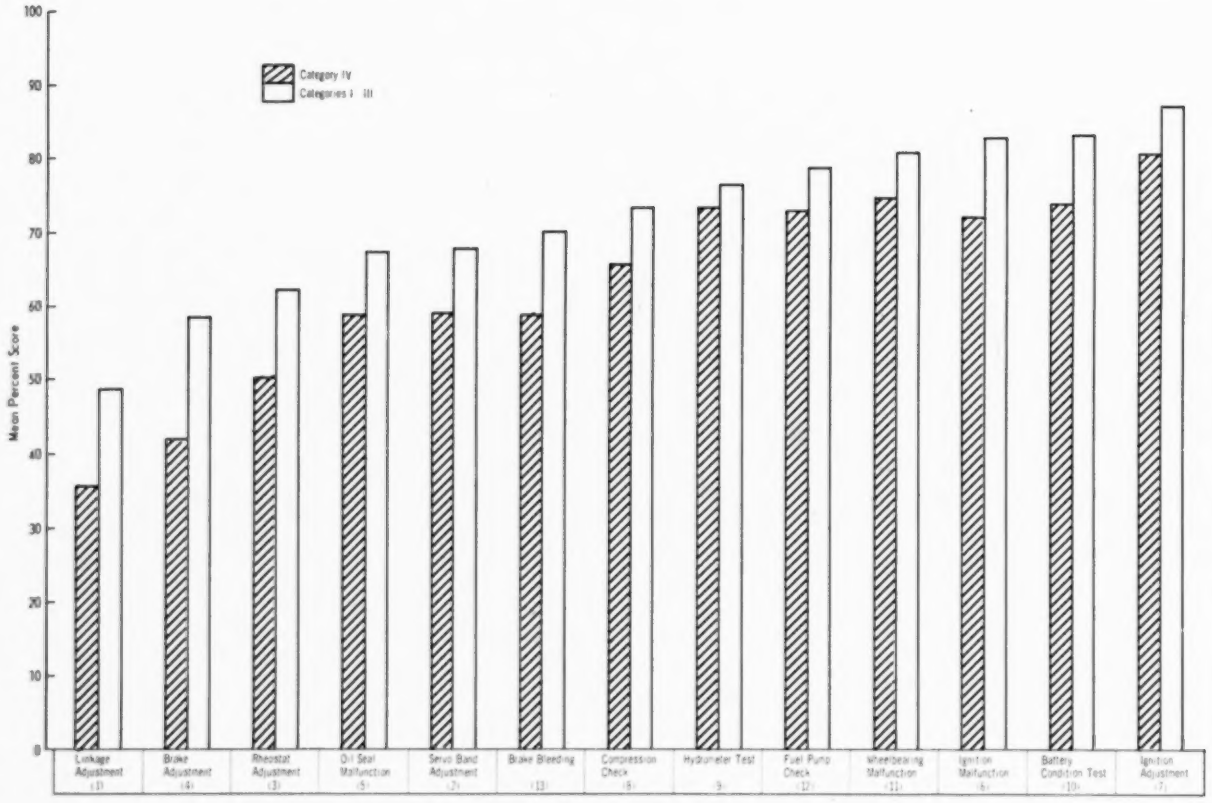

Figure 41

Supply Specialist's Job Sample Subtests Arranged According to Difficulty

(Mean Percent Score for Categories I-III and Category IV)

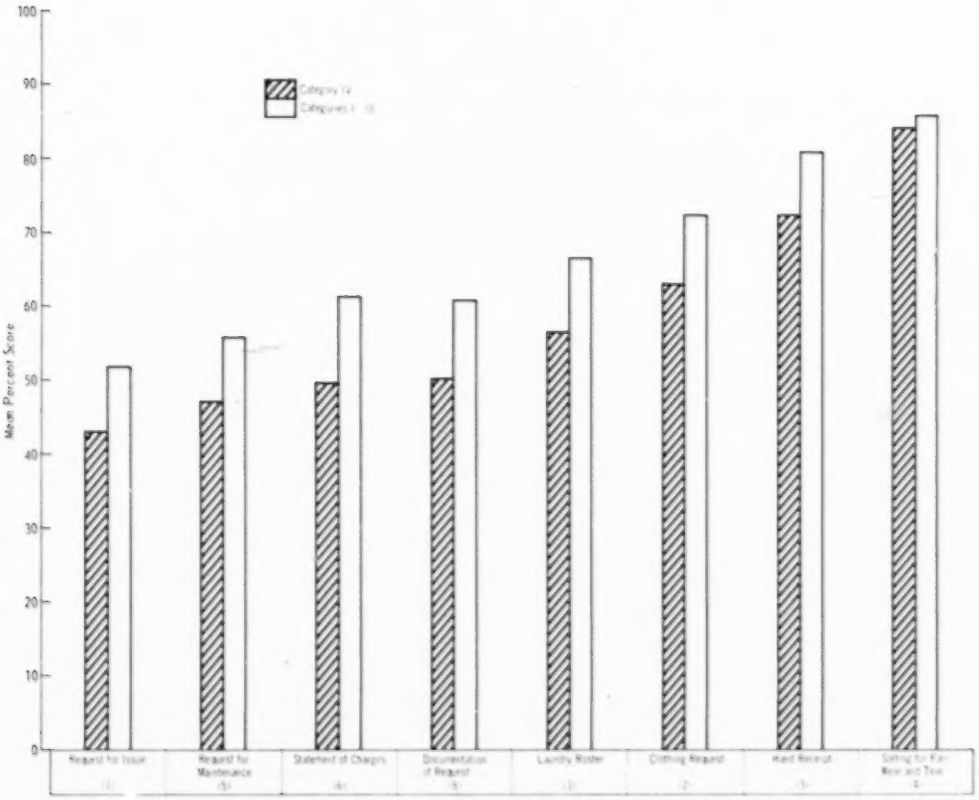

Figure 42

The correlations, of course, are much like those seen for Job Sample total score. MOJ bears a stronger relationship to part scores than AFQT regardless of difficulty level. Although the data are not completely consistent, there is a general suggestion that partial and multiple correlations tend to increase from the easy to the two higher levels of subtest difficulty. This is so in three of the four MOSs. Not surprisingly, it can generally be concluded that a man's performance on more difficult tasks is more directly related to his job experience than his performance on easier tasks.

The independent effect of AFQT on easy, medium, and difficult subtests is shown in Tables 21 through 23. As before, where AFQT is the independent variable the contributions of MOJ and age have been statistically controlled.

Analysis of the three AFQT groups on easy, medium, and difficult subsets of Job Sample test problems shows reliable differences among means in all instances but one (F

Cook's Job Sample Subtests Arranged According to Difficulty

(Mean Percent Score for Categories I-III and Category IV)

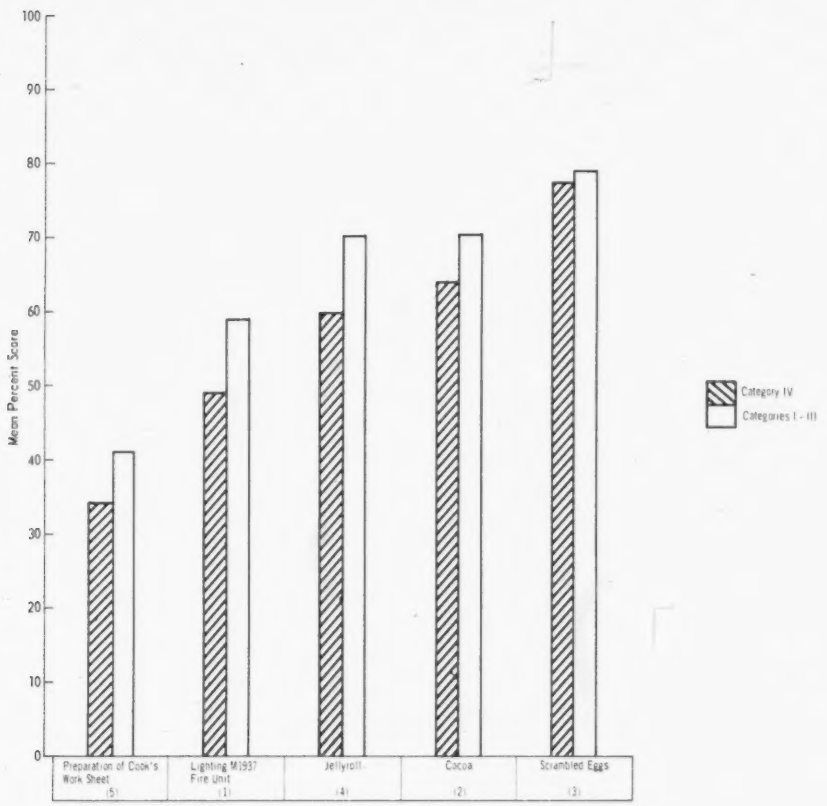

Figure 43

test). On the easy subset for Cooks there were no AFQT differences.[1] In general, specific differences between means are significant (Newman-Keuls method). Three of the four cases where comparisons between pairs of means were not significant involved comparisons within the Mental Category IV group. The most consistent differences between AFQT groups occur at the medium level of problem difficulty where there is less likelihood that a large number of men will perform either quite well or quite poorly.

Perhaps the most interesting observations about levels of problem difficulty are contained in Table 24. Here the performance of Category IVs and Non-Category IVs on the three types of problems is contrasted. The differences between the performance of Category IVs and Non-Category IVs increases rather consistently as problem difficulty

[1] Due to the relatively small number of subtests in the Cook's Job Sample test, the easy set for this MOS was represented by only one subtest—the preparation of scrambled eggs. Cooks can scramble eggs regardless of AFQT.

Armor Crewman's Performance on Easy, Medium, and Difficult Problem Subsets

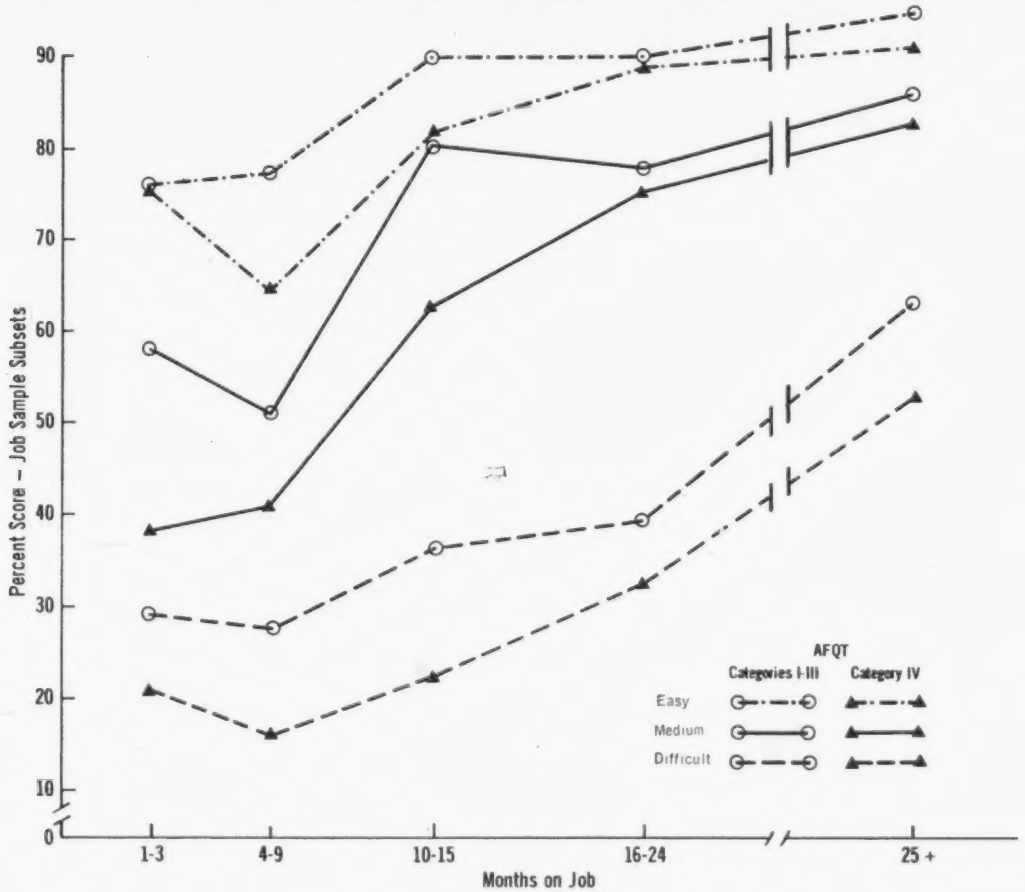

Figure 44

becomes greater. For combined MOSs the average difference between Category IVs and Non-Category IVs on the "easy" set is 4.7% whereas on the "difficult" problems this difference increases to 10.1%.

It should also be noted that in the difficult set where the widest differences between groups are seen, the greatest difference occurs between Repairman Category IVs and Non-Category IVs. Among the four MOSs studied, this can be considered the most technical job. The smallest difference in the difficult set occurs between Category IVs and Non-Category IVs who are Cooks. This finding is consistent with the traditional belief that the Cook's job provides a situation where men of lower mental ability will approach more closely the performance of men at higher ability levels.

The independent effect of MOJ on easy, medium, and difficult subsets is shown in Tables 25-27. Here, as previously, the contribution of AFQT and education have been statistically controlled.

Repairman's Performance on Easy, Medium, and Difficult Problem Subsets

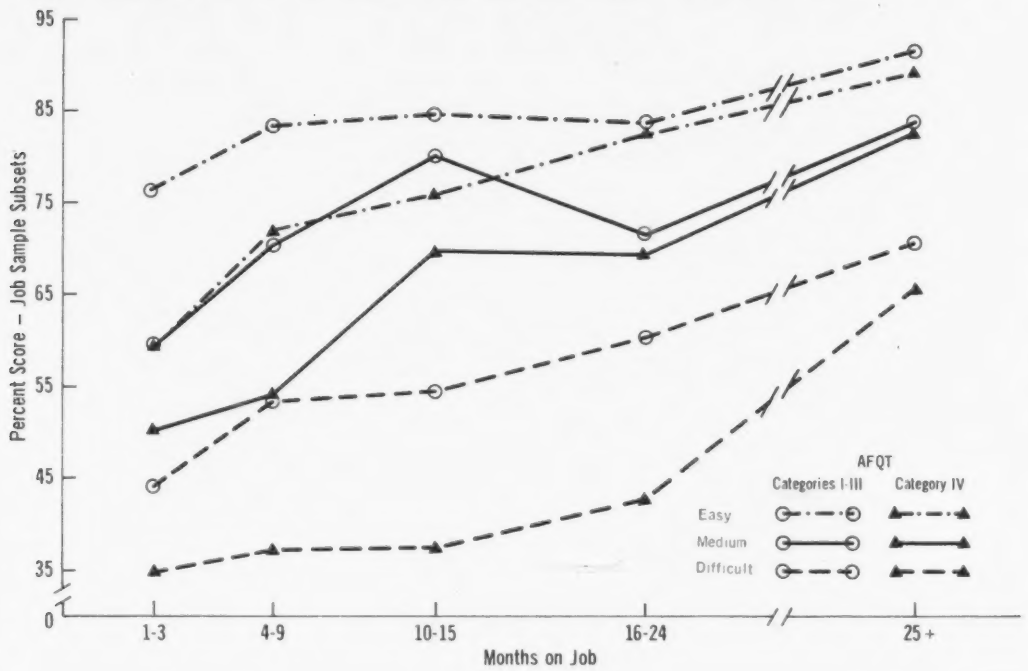

Figure 45

Supply Specialist's Performance on Easy, Medium, and Difficult Problem Subsets

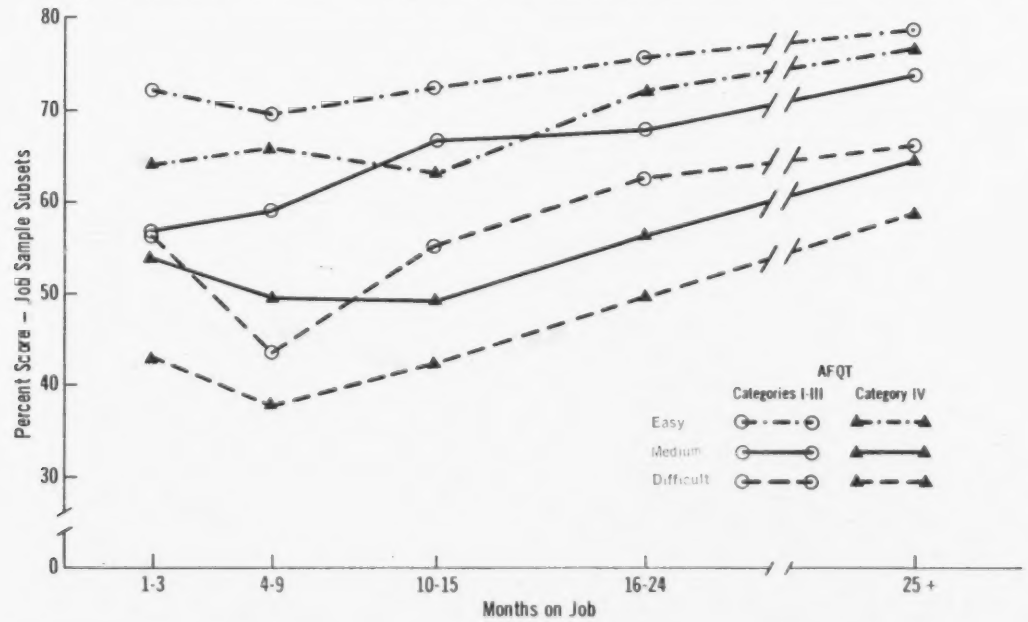

Figure 46

Cook's Performance on Easy, Medium, and Difficult Problem Subsets

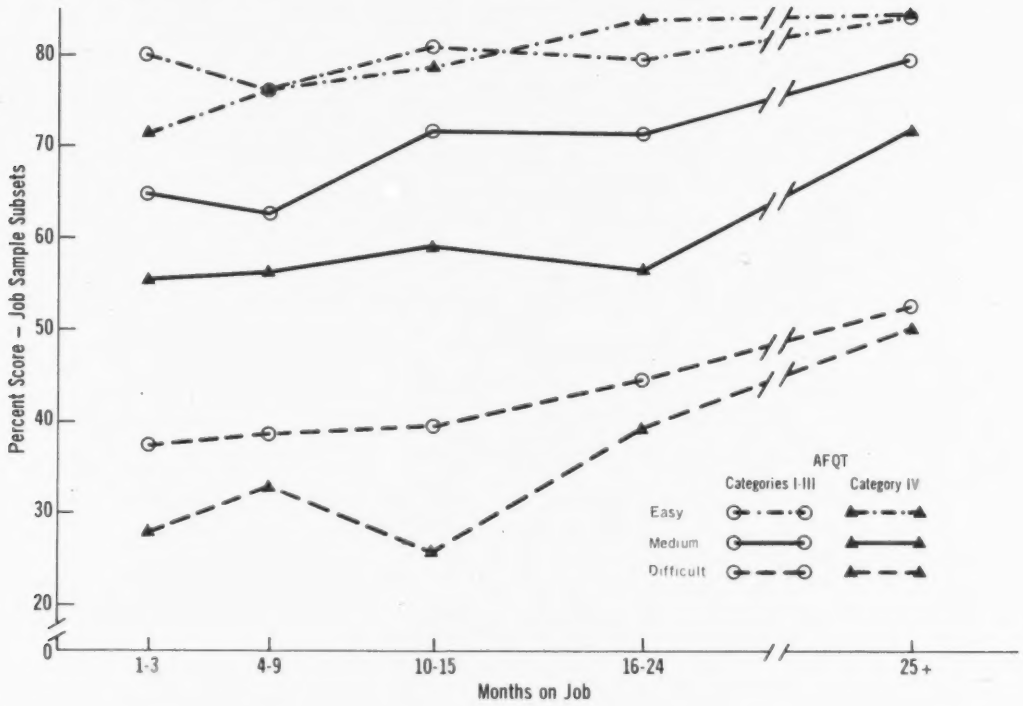

Figure 47

Inspection of the means in these tables reveals that, without exception, mean scores at all levels of problem difficulty increase with job experience. Overall tests (F) of differences among means are significant in all MOSs for each level of difficulty, and 30 of the 36 specific comparisons between pairs of means are significant. In general, it may be stated that time on the job is a significant determinant of job performance regardless of whether performance is assessed on easy, medium, or difficult tests.

In the Cook MOS, however, where three of the six nonsignificant comparisons occur, men with 1-9 MOJ and 10-24 MOJ do not differ significantly in the performance of easy, medium, or difficult tasks. It seems possible that during the first two years in a Cook's job, men are less likely to acquire some of the more subtle skills and knowledges that contribute to proficiency. Generally in this MOS, experience beyond 24 months would appear to be necessary before significant differences in performance emerge.

TASK FREQUENCY AND ITS RELATION TO PERFORMANCE

During the administration of each Job Sample subtest, subjects were asked how frequently they ordinarily performed that task as part of their regular job. Each subject indicated whether he had performed the task never, seldom, or often. Using these

Table 20

Multiple Correlations (R) for Two Variables With Scores on Easy, Medium, and Difficult Subtests[a]

(Zero-Order Correlations for Four Variables)

Level of Difficulty	Variable	Armor Crewman		Repairman		Supply Specialist		Cook	
		Zero-Order Correlation	Partial Correlation, and *R*	Zero-Order Correlation	Partial Correlation, and *R*	Zero-Order Correlation	Partial Correlation, and *R*	Zero-Order Correlation	Partial Correlation, and *R*
Easy Subtests	AFQT	.22*	.25*	.26*	.27*	.22*	.23*	.08	.08
	Education	.06		.02		.06		−.06	
	MOJ	.53*	.54*	.35*	.35*	.34*	.34*	.20*	.20*
	Age	.27*		.19*		.27*		.22*	
			R=.57		*R*=.43		*R*=.40		*R*=.22
			$p<.01$		$p<.01$		$p<.01$		$p<.01$
Medium Subtests	AFQT	.19*	.22*	.23*	.24*	.30*	.31*	.31*	.32*
	Education	.02		.03		.14*		.10	
	MOJ	.51*	.52*	.42*	.42*	.36*	.38*	.32*	.33*
	Age	.25*		.30*		.26*		.34*	
			R=.55		*R*=.47		*R*=.47		*R*=.44
			$p<.01$		$p<.01$		$p<.01$		$p<.01$
Difficult Subtests	AFQT	.31*	.43*	.25*	.26*	.27*	.29*	.25*	.26*
	Education	.07		.14*		.12*		.13*	
	MOJ	.69*	.73*	.32*	.32*	.38*	.39*	.38*	.39*
	Age	.55*		.25*		.30*		.34*	
			R=.76		*R*=.40		*R*=.46		*R*=.45
			$p<.01$		$p<.01$		$p<.01$		$p<.01$

[a]* Indicates statistical significance ($p<.05$)

Table 21

Comparisons of Three AFQT Groups on Easy Job Sample Subtests

MOS	AFQT Group	N	Raw Mean	Adjusted Mean	Differences Between Means		
					Low IV vs. High IV	Low IV vs. Non-IV	High IV vs. Non-IV
Armor Crewman	0-20	97	80.1	81.5			
	21-30	92	84.3	83.3			
	31-99	187	87.9	87.7			
	F=10.1, df=2 and 371, p<.01				NS	Sig.	Sig.
Repairman	0-20	91	72.4	73.9			
	21-30	103	81.5	80.0			
	31-99	193	84.6	84.7			
	F=11.1, df=2 and 382, p<.01				Sig.	Sig.	Sig.
Supply Specialist	0-20	100	66.2	67.0			
	21-30	98	70.7	70.0			
	31-99	198	73.1	73.0			
	F=10.0, df=2 and 391, p<.01				Sig.	Sig.	NS
Cook	0-20	106	75.2	75.6			
	21-30	78	80.8	80.2			
	31-99	182	78.8	78.8			
	F=2.1, df=2 and 361, NS				--	--	--

responses, a frequency index[1] was generated for each subtest for the Category IV group, the Non-Category IV group, and for the combined sample in each MOS. This section employs the index in examining (a) differences between Category IVs and Non-Category IVs in the frequency with which they perform different tasks; and (b) comparisons of the performance of Category IVs and Non-Category IVs on job sample subtests as related to their frequency of performing those tasks on the job.

Subtests Ordered by Frequency of Occurrence on the Job

The frequency index for each Job Sample subtest for Category IVs and Non-Category IVs is presented in Figures 48-51 (Tables A-44—A-47 in Appendix A) for each of the four MOSs. In each figure, subtests have been arranged in order of increasing frequency of performance for the combined groups.

It can be seen that there is overall a difference in the frequency with which Category IVs and Non-Category IVs report that they perform the tasks making up the

[1] Indices were computed by assigning weights of 0, 1, and 2 to the responses "never," "seldom," and "often," and obtaining mean subtest weights.

Table 22

Comparisons of Three AFQT Groups on Medium Job Sample Subtests

MOS	AFQT Group	N	Raw Mean	Adjusted Mean	Differences Between Means		
					1-9 mos. vs. 10-24 mos.	1-9 mos. vs. 25+ mos.	10-24 mos. vs. 25+ mos.
Armor Crewman	0-20	97	62.1	64.7			
	21-30	92	63.3	67.5			
	31-99	187	74.5	74.0			
	F=6.2, df=2 and 371, p<.01				Sig.	Sig.	Sig.
Repairman	0-20	91	59.7	61.5			
	21-30	103	69.4	67.4			
	31-99	193	72.8	73.0			
	F=10.3, df=2 and 382, p<.01				Sig.	Sig.	Sig.
Supply Specialist	0-20	100	49.9	51.2			
	21-30	98	58.3	57.1			
	31-99	198	64.2	64.2			
	F=24.2, df=2 and 391, p<.01				Sig.	Sig.	Sig.
Cook	0-20	106	55.9	56.6			
	21-30	78	62.3	61.2			
	31-99	182	67.6	67.6			
	F=19.8, df=2 and 361, p<.01				Sig.	Sig.	Sig.

Job Sample tests. In two MOSs, Supply Specialist and Cook, Non-Category IVs indicate they perform each subtest more frequently. In Armor Crewman, Non-Category IVs report they perform 15 out of the 20 subtests more frequently. Of the other five subtests in Armor Crewman, there are only three where Category IVs report greater frequency of performance, the remaining two being reported equally by both groups. In Repairman, Non-Category IVs report they perform 8 out of 13 subtests more frequently, with one tie among the remaining subtests.

While the frequency index undoubtedly is an imperfect reflection of actual experience of men on tasks, the consistency with which Non-Category IVs report greater frequency is compelling. In the absence of any evidence to the contrary, it must be concluded that Category IVs less frequently receive assignments to perform these tasks.

Relationship Between Task Frequency and Subtest Performance in Two Different AFQT Groupings

Having observed that Non-Category IVs are consistently superior in the performance of the Job Sample subtests and that they encounter these tasks more frequently in their jobs, it is desirable to examine the relationship between task frequency and task performance. In Figures 52-59 (Tables A-48—A-55 in Appendix A) subtest frequency and subtest performance data are presented jointly for the Category IVs and Non-Category IVs of each of the MOSs individually. In each Figure, average subtest scores are graphed

Table 23

Comparisons of Three AFQT Groups on Difficult Job Sample Subtests

MOS	AFQT Group	N	Raw Mean	Adjusted Mean	Differences Between Means		
					Low IV vs. High IV	Low IV vs. Non-IV	High IV vs. Non-IV
Armor Crewman	0-20	97	27.9	30.4			
	21-30	92	40.4	37.6			
	31-99	187	44.6	44.7			
	F=31.6, df=2 and 371, $p<.01$				Sig.	Sig.	Sig.
Repairman	0-20	91	38.5	40.2			
	21-30	103	48.2	46.2			
	31-99	193	57.7	57.9			
	F=14.1, df=2 and 382, $p<.01$				NS	Sig.	Sig.
Supply Specialist	0-20	100	42.5	44.1			
	21-30	98	48.4	47.0			
	31-99	198	54.2	54.1			
	F=11.6, df=2 and 391, $p<.01$				NS	Sig.	Sig.
Cook	0-20	106	32.2	33.0			
	21-30	78	37.9	36.6			
	31-99	182	41.1	41.2			
	F=12.6, df=2 and 361, $p<.01$				Sig.	Sig.	Sig.

above the line labeled "Order of Frequency" and the value of the frequency index is plotted below the line.

Inspection of the graphs reveals only a minimal relationship between the reported frequency of tasks and their performance by Category IVs and Non-Category IVs on the Job Sample tests. Only in two MOSs, Repairman and Supply Specialist, do the graphs suggest even the slightest tendency for performance to increase with increasing job frequency. These observations are supported by the rank order correlations of frequency with performance shown in Table 28. Only the correlations for Repairman attain statistical significance. The remainder cannot be assumed to differ from zero.

While a relationship between performance frequency and performance level is ordinarily to be expected, it must be recognized that the frequency index provides only the grossest measure of actual job frequency. What "frequent" means to one man can easily mean "seldom" to another. Further, these words are likely to be interpreted quite differently by men with widely disparate amounts of job experience. Given the probably low reliability of the frequency index, the general lack of relationship between frequency and performance is not surprising.

In Armor Crewman and Supply Specialist the rank order of clusters of different subtests for frequency are so similar as to suggest that in all likelihood the ordering within clusters is probably random. In Cooks, the small number of subtests probably precludes the emergence of any relationship. In Repairman, where some relationship does appear, the infrequently performed subtests were all carried out on the M60A1

Table 24

Adjusted Means of Subtests Grouped by Difficulty

(Percent)

Group	N	Easy	Medium	Difficult
Armor Crewman				
Category IV	189	82.38	66.06	33.91
Non-Category IV	187	87.66	74.05	44.71
Difference		5.28	7.99	10.80
Repairman				
Category IV	194	77.12	64.64	43.39
Non-Category IV	193	84.72	72.96	57.93
Difference		7.60	8.32	14.54
Supply Specialist				
Category IV	198	68.50	54.12	45.54
Non-Category IV	198	73.05	64.15	54.11
Difference		4.55	10.03	8.57
Cook				
Category IV	184	77.57	58.60	34.56
Non-Category IV	182	78.78	67.57	41.15
Difference		1.21	8.97	6.59

tank (the five subtests on the left side of the graphs). The frequently performed tasks, on the other hand, were all carried out on a truck or jeep (the eight subtests on the right side of the graphs).

It can be seen that the tank subtests were performed extremely infrequently and the overall performance level for these tasks was considerably lower than that for the truck-jeep tasks. Separately, within the tank problems or the truck-jeep problems, there does not appear to be any substantial relationship between task frequency and task performance. The relationship that does occur between frequency and performance in Repairman probably arises from the frequency-performance differences between tank problems and truck-jeep problems.

PERFORMANCE OF TASK ELEMENTS PRESENTING DIFFERENT BEHAVIORAL DEMANDS

In an effort to provide a more general description of the capabilities of men at different AFQT levels, a system for classifying each step of a Job Sample test was devised. This system permitted the classification and grouping of task elements that were common to more than one subtest of a Job Sample test. Furthermore, to the extent that common task elements were identified in different Job Sample tests, the classification system provides a means for analyzing performance with regard to MOS.

Table 25

Comparisons of Three MOJ Groups on Easy Job Sample Subtests

MOS	MOJ Group	N	Raw Mean	Adjusted Mean	Differences Between Means		
					1-9 MOJ vs. 10-24 MOJ	1-9 MOJ vs. 25+ MOJ	10-24 MOJ vs. 25+ MOJ
Armor Crewman	1- 9	107	71.83	72.02			
	10-24	128	87.74	87.61			
	25+	141	92.51	92.48			
	F=102.79, df=2 and 371, p<.01				Sig.	Sig.	Sig.
Repairman	1- 9	160	74.34	74.46			
	10-24	146	82.29	82.24			
	25+	81	91.40	91.26			
	F=23.99, df=2 and 382, p<.01				Sig.	Sig.	Sig.
Supply Specialist	1- 9	191	67.79	67.84			
	10-24	112	70.29	70.00			
	25+	93	77.51	77.73			
	F=24.66, df=2 and 391, p<.01				NS	Sig.	Sig.
Cooks	1- 9	237	75.91	75.94			
	10-24	81	80.86	80.86			
	25+	48	84.79	84.63			
	F=7.52, df=2 and 361, p<.01				NS	Sig.	NS

In analyzing task elements, each subtest step was classified according to the degree of structure provided to the subjects for the accomplishment of that step. How structured a step was, depended on a combination of characteristics:

(1) Whether or not the step had been named or identified, such as part of the test instructions or through the subject's use of a manual.

(2) Whether or not technical or enabling knowledge was required.

(3) Whether or not the step involved a specific degree of precision or conformance to a precise standard.

(4) Where required, whether or not the standard had been specified for the subject.

(5) Whether or not interpretive behavior involving the application of rules or analysis of interrelationships was required.

The classification of steps in Job Sample subtests was accomplished jointly by military specialists assigned to the research team and by members of the HumRRO staff. In a few instances where complete agreement could not be reached about the proper classification of a step, the step was omitted from this analysis. Thus, the number of steps classified in any MOS is approximately the same as the total number of steps in the separate Job Sample tests.

Two mutually exclusive classifications of steps in the Job Sample tests were developed. The first set is characterized by the letter "N" signifying that each step

Table 26

Comparisons of Three MOJ Groups on Medium Job Sample Subtests

MOS	MOJ Group	N	Raw Mean	Adjusted Mean	Differences Between Means		
					1-9 MOJ vs. 10-24 MOJ	1-9 MOJ vs. 25+ MOJ	10-24 MOJ vs. 25+ MOJ
Armor Crewman	1- 9	107	46.42	46.80			
	10-24	128	74.30	73.99			
	25+	141	84.09	84.08			
	F=88.67, df=2 and 371, $p<.01$				Sig.	Sig.	Sig.
Repairman	1- 9	160	58.85	58.97			
	10-24	146	71.83	71.76			
	25+	81	82.94	82.82			
	F=40.69, df=2 and 382, $p<.01$				Sig.	Sig.	Sig.
Supply Specialist	1- 9	191	54.15	54.21			
	10-24	112	59.55	59.01			
	25+	93	68.88	69.43			
	F=28.85, df=2 and 391, $p<.01$				Sig.	Sig.	Sig.
Cooks	1- 9	237	59.86	60.00			
	10-24	81	64.65	64.41			
	25+	48	76.17	75.87			
	F=24.24, df=2 and 361, $p<.01$				NS	Sig.	Sig.

within the set has been named for the subject. In the second set, characterized by the letter "K_1," each step has not been named and must be known by the subject. A total of 13 categories are represented in the two sets:[1]

Category	Definition
N	Step is named
NK_2	Step is named and technical or enabling knowledge is required
NK_2S	Step is named, technical or enabling knowledge is required, and standard to be met is specified
NK_2I	Step is named, technical or enabling knowledge and interpretive behavior is required
NS	Step is named and standard to be met is specified
NI	Step is named and interpretive behavior is required
K_1	Step is not named
K_1K_2	Step is not named and technical or enabling knowledge is required

[1] Though there are 24 logically possible combinations that can be derived from the characteristics enumerated above, entries were made in only 13 categories during the classification of subtest steps.

Table 27

Comparisons of Three MOJ Groups on Difficult Job Sample Subtests

MOS	MOJ Group	N	Raw Mean	Adjusted Mean	Differences Between Means		
					1-9 MOJ vs. 10-24 MOJ	1-9 MOJ vs. 25+ MOJ	10-24 MOJ vs. 25+ MOJ
Armor Crewman	1- 9	107	22.74	23.21			
	10-24	128	33.02	32.65			
	25+	141	57.53	57.51			
	F=175.69, df=2 and 371, p<.01				Sig.	Sig.	Sig.
Repairman	1- 9	160	42.91	43.18			
	10-24	146	49.42	49.01			
	25+	81	68.11	68.29			
	F=21.98, df=2 and 382, p<.01				NS	Sig.	Sig.
Supply Specialist	1- 9	191	42.38	42.45			
	10-24	112	52.18	51.62			
	25+	93	62.29	62.82			
	F=41.12, df=2 and 391, p<.01				Sig.	Sig.	Sig.
Cooks	1- 9	237	34.71	34.82			
	10-24	81	38.52	38.29			
	25+	48	52.15	51.98			
	F=32.84, df=2 and 361, p<.01				NS	Sig.	Sig.

Category	Definition
$K_1K_2K_3$	Step is not named, technical or enabling knowledge is required, and standard to be met is not specified
K_1K_2S	Step is not named, technical or enabling knowledge is required, and standard to be met is specified
K_1K_2I	Step is not named, technical or enabling knowledge and interpretive behavior are required
K_1K_3	Step is not named and standard to be met is not specified
K_1I	Step is not named, interpretive behavior is required

The proportion of steps in different categories varied greatly. For example, of the 359 steps to be classified for Armor Crewman,[1] 185 were in the K_1K_2 category whereas only three were in the N category. In contrast, of the 149 steps classified for Cooks, 20 fell into the K_1K_2 category and 62 fell in the N category. Finally, not all

[1] In the Armor Crewman Job Sample test no manuals were available. Thus, a high proportion of the steps in this test required that the subjects recall the steps to be performed.

Armor Crewman's Job Sample Subtests Arranged According to Frequency of Performance

(Frequency Indices for Category IV and Non-Category IV)

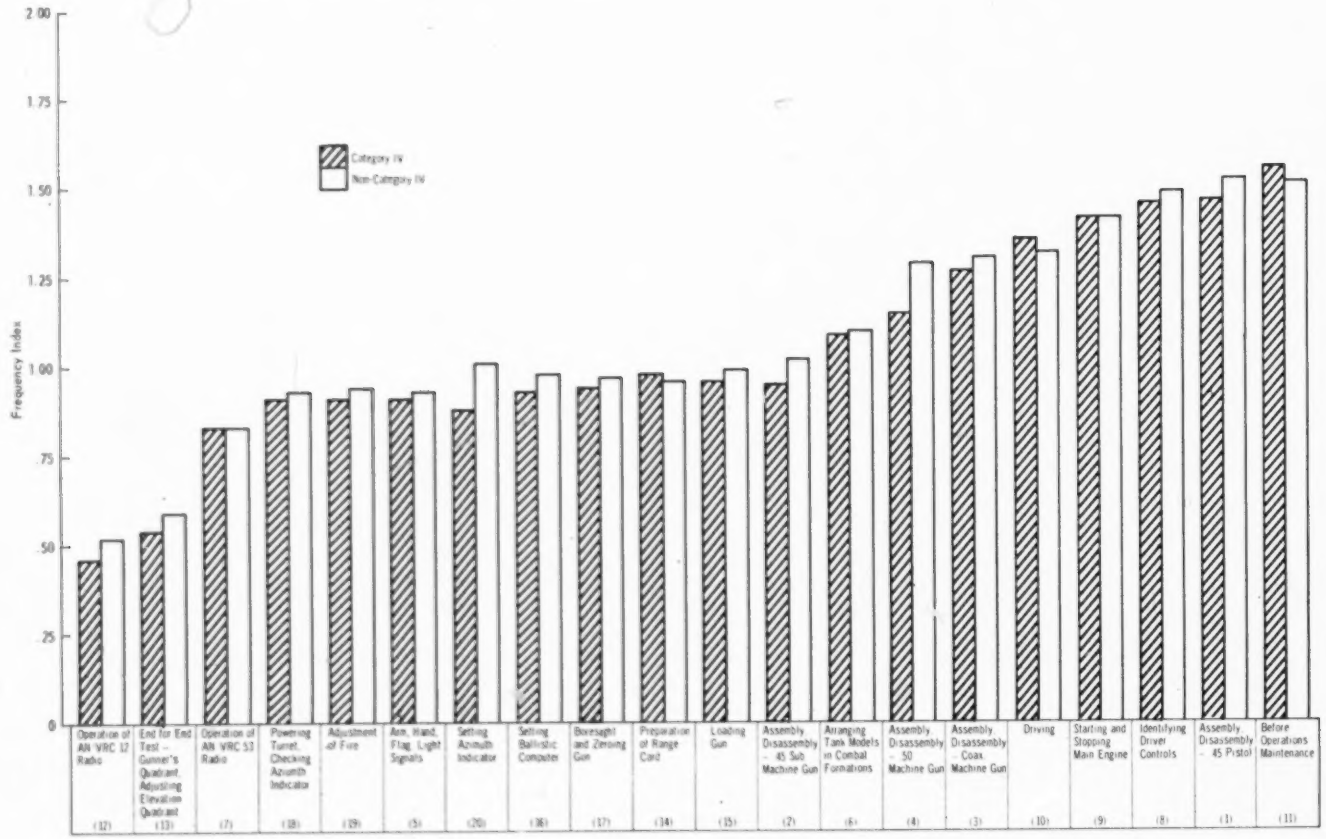
2.00
1.75
1.50
1.25
1.00
.75
.50
.25
0
Frequency Index
Category IV
Non-Category IV
Operation of AN VRC 12 Radio (12)
End for End Test – Gunner's Quadrant, Adjusting Elevation Quadrant (13)
Operation of AN VRC 53 Radio (7)
Powering Turret, Checking Azimuth Indicator (18)
Adjustment of Fire (19)
Arm, Hand, Flag, Light Signals (5)
Setting Azimuth Indicator (20)
Setting Ballistic Computer (16)
Boresight and Zeroing Gun (17)
Preparation of Range Card (14)
Loading Gun (15)
Assembly Disassembly – 45 Sub Machine Gun (2)
Arranging Tank Models in Combat Formations (6)
Assembly Disassembly – 50 Machine Gun (4)
Assembly Disassembly – Coax Machine Gun (3)
Driving (10)
Starting and Stopping Main Engine (9)
Identifying Driver Controls (8)
Assembly Disassembly – 45 Pistol (1)
Before Operations Maintenance (11)

Figure 48

Repairman's Job Sample Subtests Arranged According to Frequency of Performance

(Frequency Indices for Category IV and Non-Category IV)

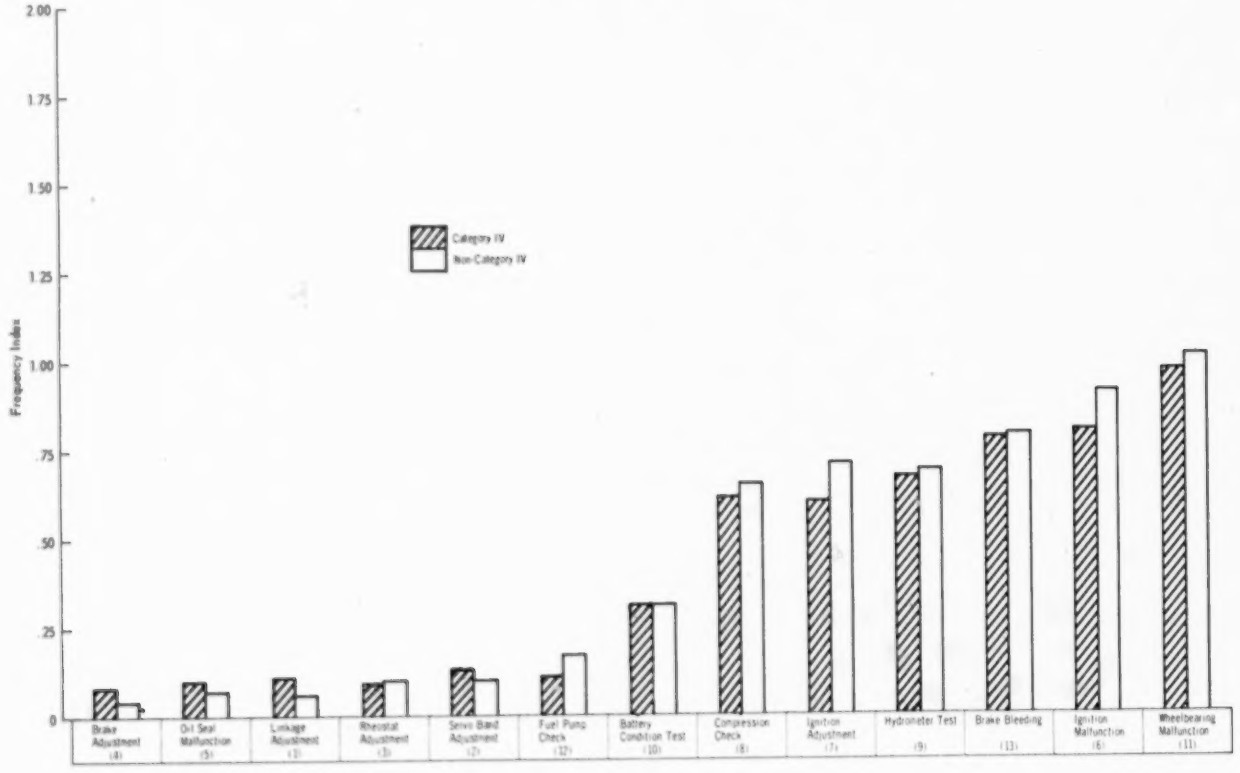

Figure 49

Supply Specialist's Job Sample Subtests Arranged According to Frequency of Performance
(Frequency Indices for Category IV and Non-Category IV)

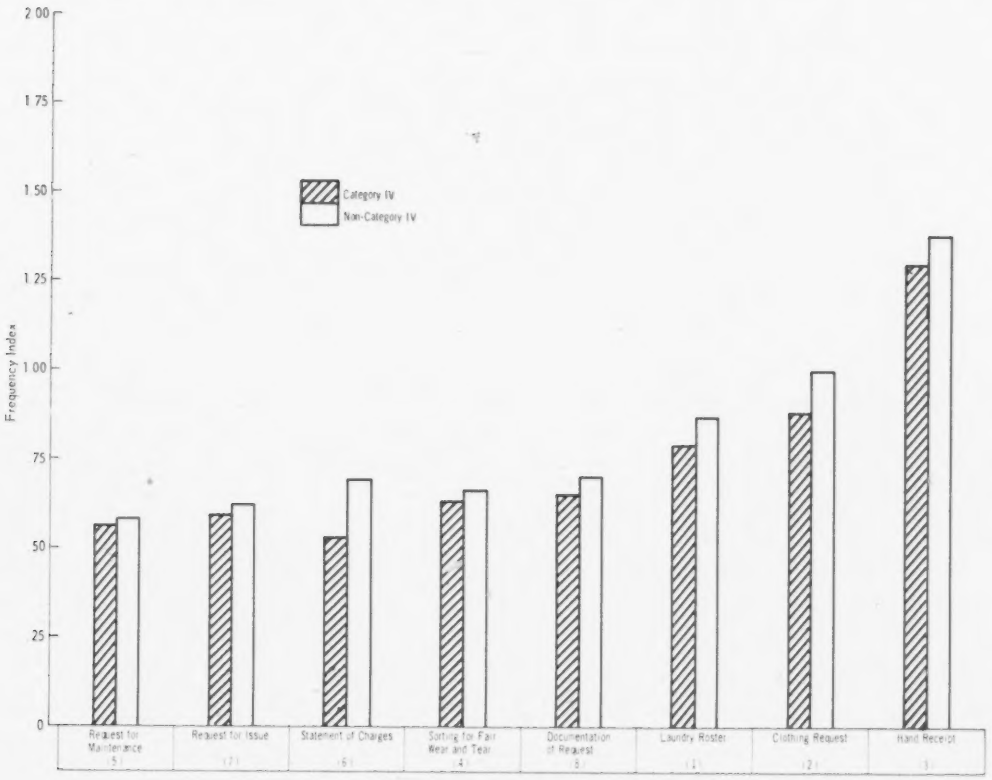

Figure 50

categories were used in all MOSs. (The incidence of categorized items for each MOS is presented in Table 2 of Appendix B.)

Following the classification of job acts, data analysis was restricted to nine categories of behavior in order to include only: (a) categories which contained a reasonably large number of steps, and (b) categories which were represented in at least two of the four MOSs.

Table 29 lists the categories of the two sets ordered on the basis of a rational analysis of task complexity. Within each set each subsequent line represents a more complex category. Examining the N set, NS is seen to be more complex than N alone. NK_2S and NK_2, the succeeding categories, while more complex than N and NS, are less clearly ordered. While NK_2S would seem to involve an additional demand, the S element in combination with the N element provides a subject with additional

Cook's Job Sample Subtests Arranged According to Frequency of Performance

(Frequency Indices for Category IV and Non-Category IV)

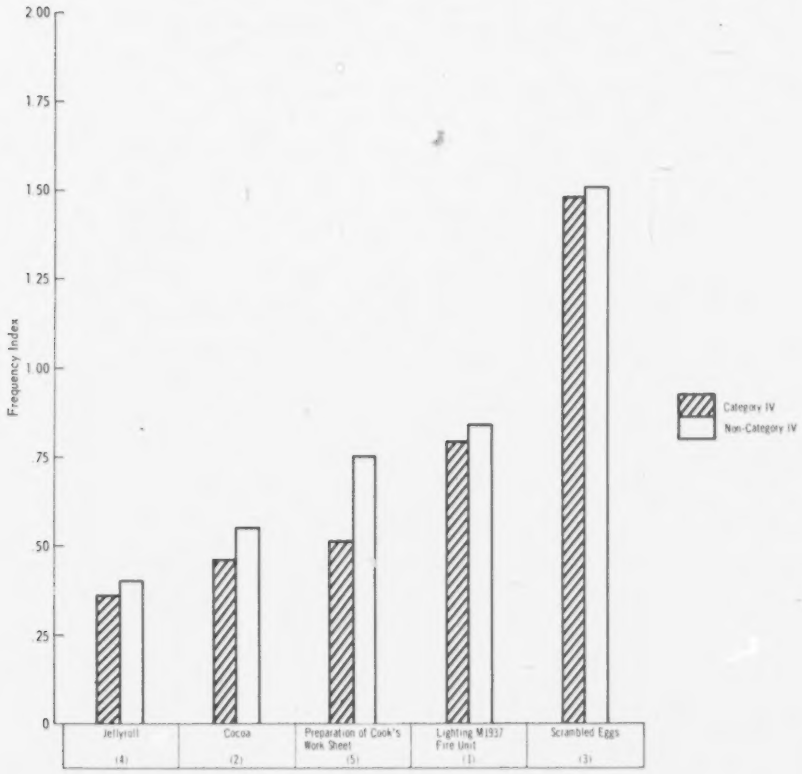

Figure 51

information which may serve as a cue to recall of the K_2 element.[1] As subsequently will be seen, in the two MOSs where these categories are represented, the order for Repairman reverses the order for Armor Crewman. NK_2I, requiring interpretation, is the most complex category of this set.

In examining the K_1 set, K_1 is seen as less complex than any succeeding category. The next two categories, K_1K_2 and K_1K_2S, may be viewed as containing

[1] For example, one of the NK_2S steps in the Armor Crewman's test requires the man to zero azimuth and micrometer pointers in response to the verbal instruction "Zero all scales," Though the subject must possess technical knowledge that he is to depress and turn the azimuth-micrometer resetter knob to perform this operation, he is virtually led to its accomplishment by the information that it is scales that are to be zeroed. In contrast, as an example of an NK_2 item, each Armor Crewman was required to shift a tank from neutral into reverse in response to arm and hand signals. In this case the man had to possess knowledge of what the signal meant and how to shift the tank's gears. The signal, specifying the step to be performed, in no way provided him with cues for the accomplishment of the task.

Performance and Frequency on Subtests for Armor Crewmen in Category IV Group

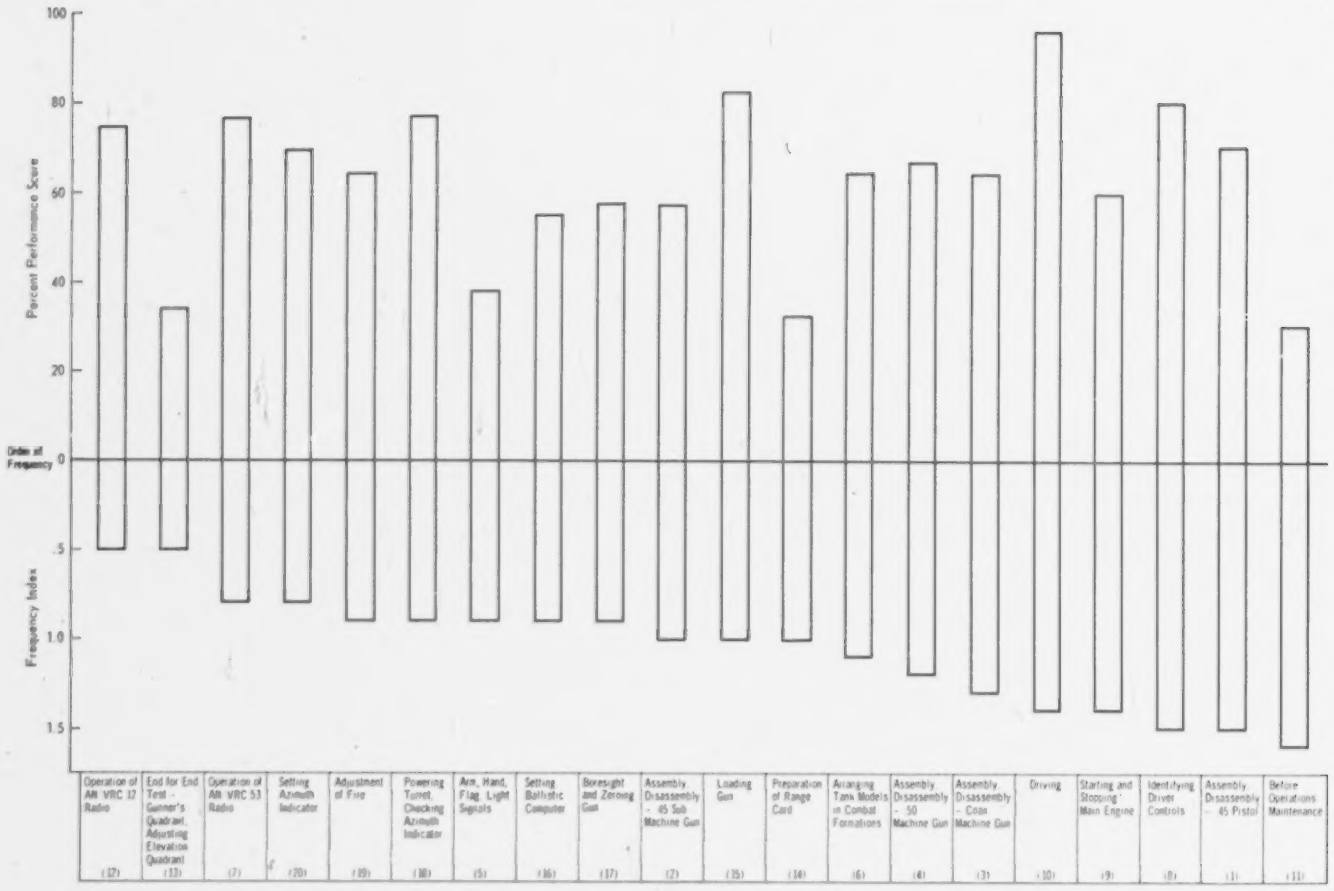
100
80
60
40
20
Order of Frequency 0
.5
1.0
1.5
Percent Performance Score
Frequency Index
Operation of AN VRC 12 Radio (12)
End for End Test - Gunner's Quadrant, Adjusting Elevation Quadrant (13)
Operation of AN VRC 53 Radio (7)
Setting Azimuth Indicator (20)
Adjustment of Fire (19)
Powering Turret, Checking Azimuth Indicator (18)
Arm, Hand, Flag, Light Signals (5)
Setting Ballistic Computer (16)
Boresight and Zeroing Gun (17)
Assembly, Disassembly - .45 Sub Machine Gun (2)
Loading Gun (15)
Preparation of Range Card (14)
Arranging Tank Models in Combat Formations (6)
Assembly, Disassembly - .50 Machine Gun (4)
Assembly, Disassembly - Coax Machine Gun (3)
Driving (10)
Starting and Stopping Main Engine (9)
Identifying Driver Controls (8)
Assembly, Disassembly - .45 Pistol (1)
Before Operations Maintenance (11)

Figure 52

Performance and Frequency on Subtests for Armor Crewmen in Non-Category IV Group

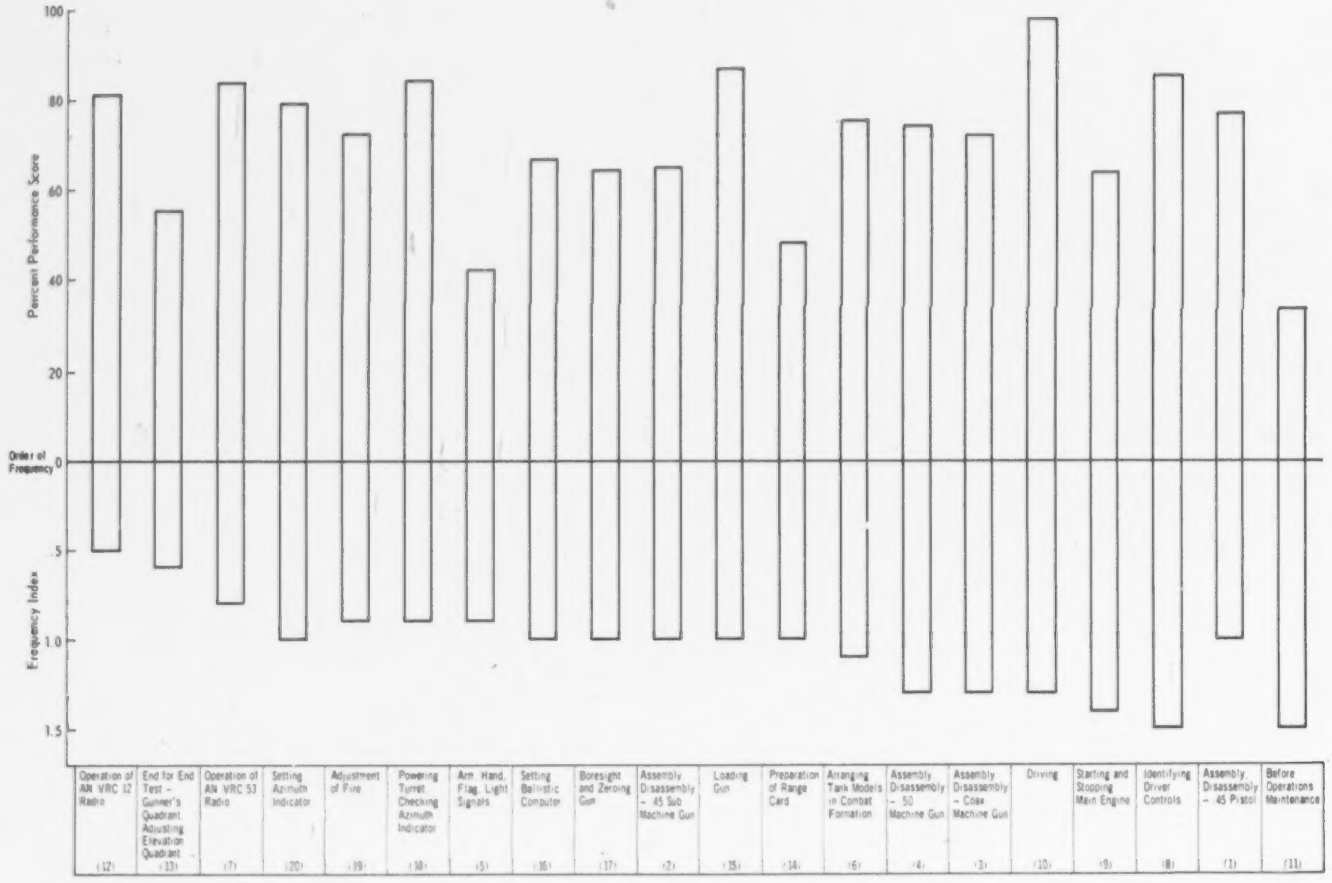
Percent Performance Score
100
80
60
40
20
Order of Frequency 0
.5
1.0
1.5
Frequency Index
Operation of AN VRC 12 Radio (12)
End for End Test – Gunner's Quadrant Adjusting Elevation Quadrant (13)
Operation of AN VRC 53 Radio (7)
Setting Azimuth Indicator (20)
Adjustment of Fire (19)
Powering Turret Checking Azimuth Indicator (18)
Arm, Hand, Flag, Light Signals (5)
Setting Ballistic Computer (16)
Boresight and Zeroing Gun (17)
Assembly Disassembly – 45 Sub Machine Gun (2)
Loading Gun (15)
Preparation of Range Card (14)
Arranging Tank Models in Combat Formation (6)
Assembly Disassembly – 50 Machine Gun (4)
Assembly Disassembly – Coax Machine Gun (3)
Driving (10)
Starting and Stopping Main Engine (9)
Identifying Driver Controls (8)
Assembly Disassembly – 45 Pistol (1)
Before Operations Maintenance (11)

Figure 53

Performance and Frequency on Subtests for Repairmen in Category IV Group

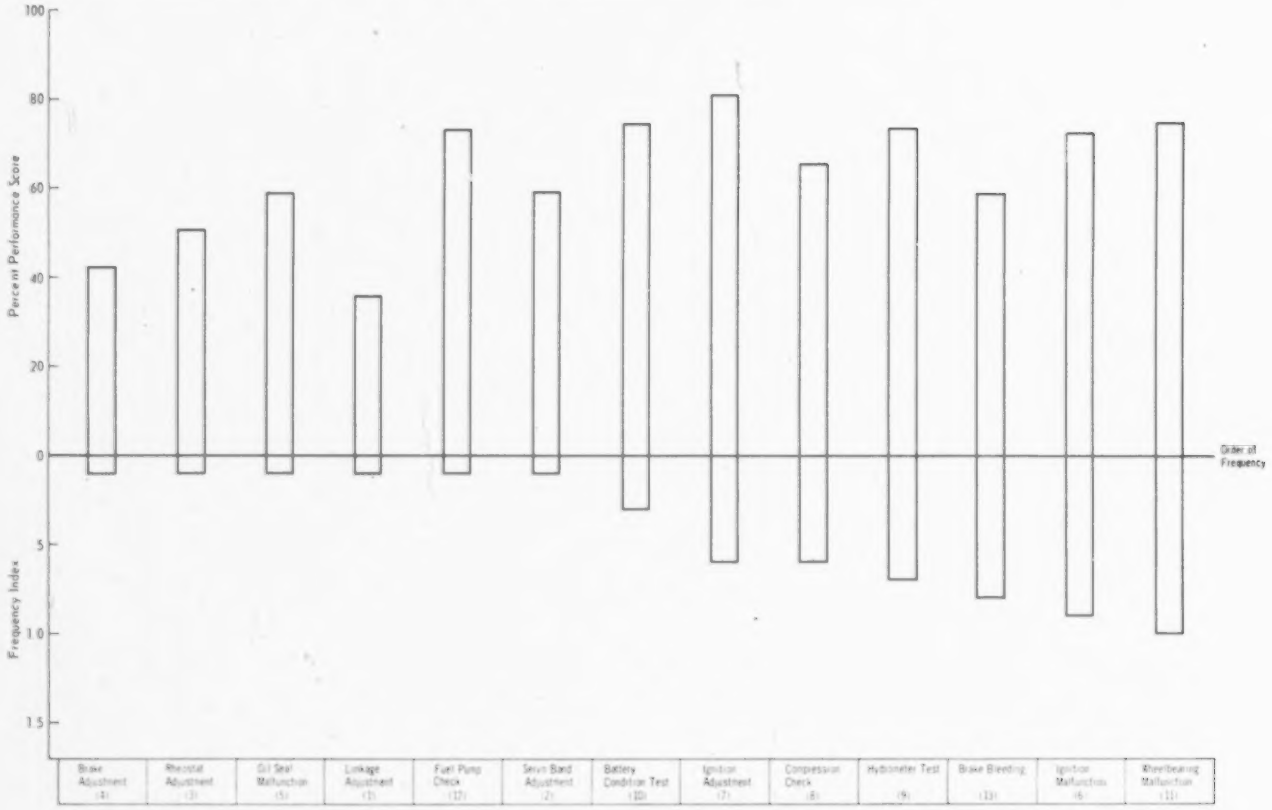

Figure 54

Performance and Frequency on Subtests for Repairmen in Non-Category IV Group

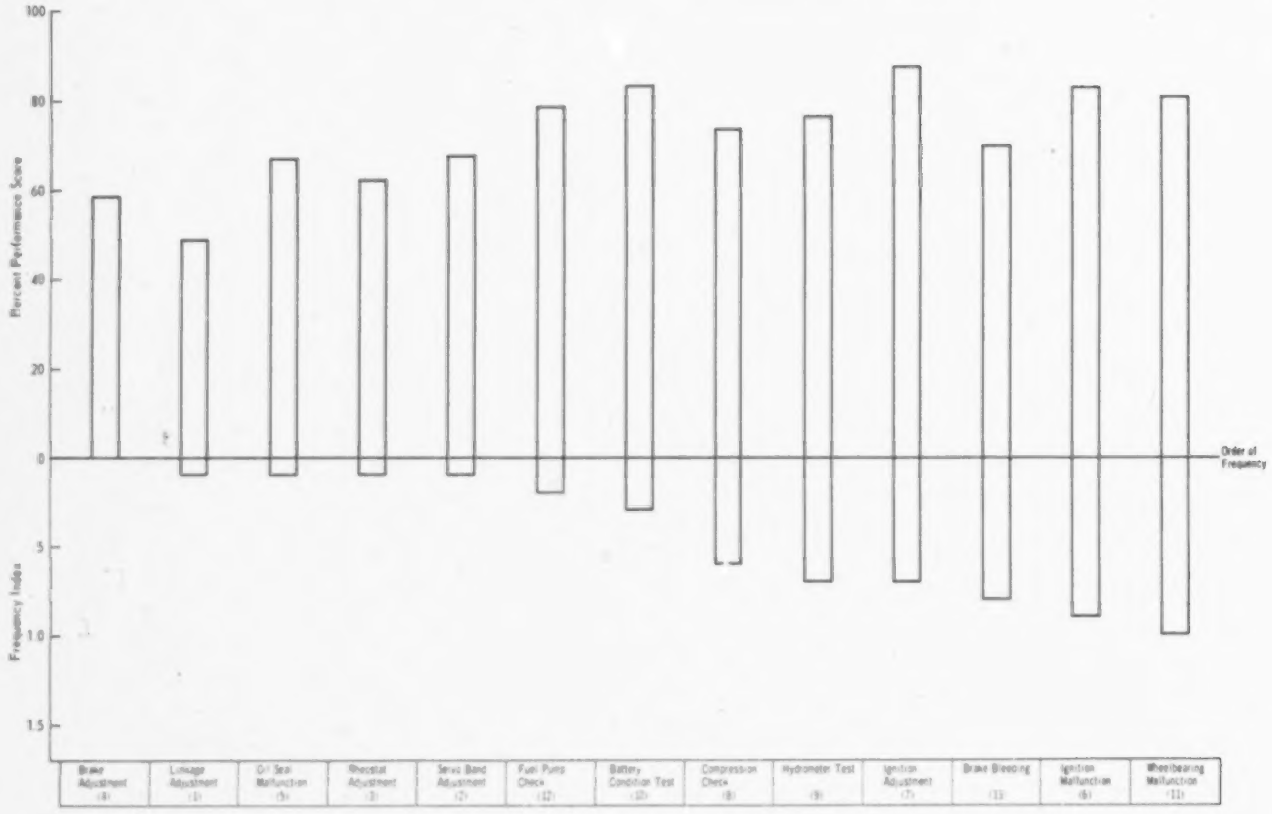

Figure 55

Performance and Frequency on Subtests for Supply Specialists in Category IV Group

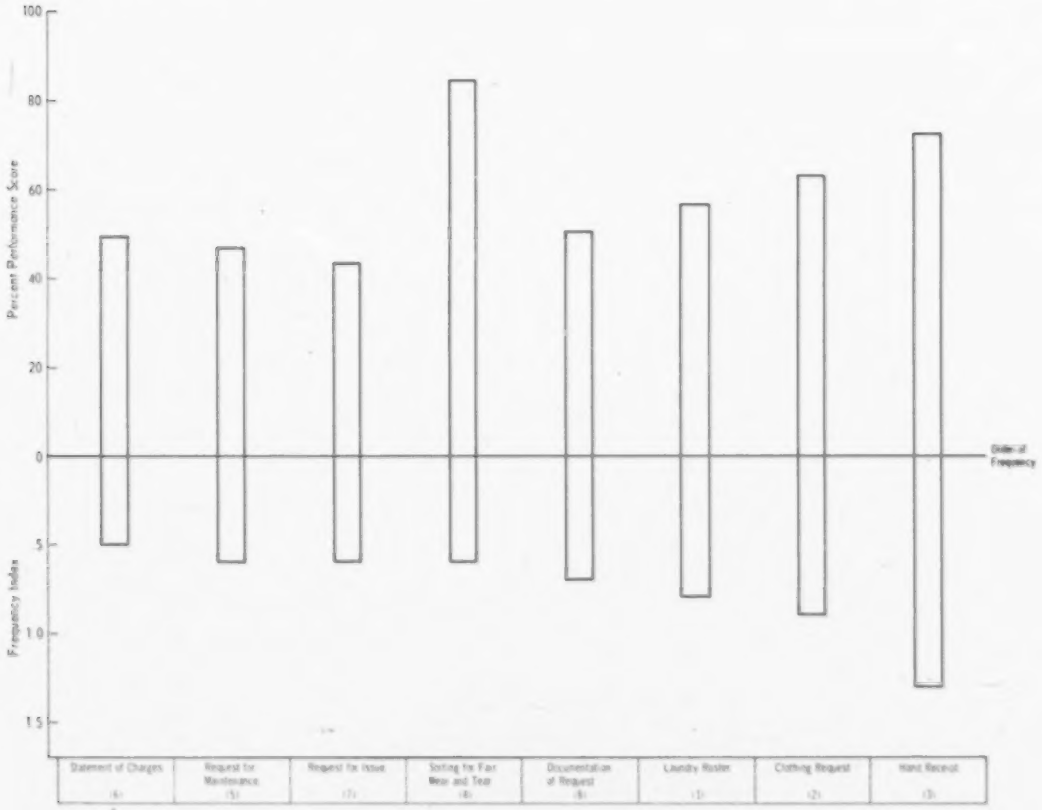

Figure 56

elements analogous to NK_2 and NK_2S. However, their ordering on the complexity dimension has been reversed. Specification of the standard (S) to be met in an unnamed step (K_1K_2S) does not generally provide a cue to recall of technical knowledge (K_2) as it does in a named step (NK_2S).[1] $K_1K_2K_3$ is the most complex category of the set.

Examination of the means contained in Table 29 suggests that the classification system orders elements of job behavior in a meaningful manner, that is, the data generally conform to the analysis of category complexity.

[1] For example, in one of the K_1K_2S steps in the Armor Crewman's test a man responds to the fire command, "Gunner, HEP, anti-tank, 1800, fire," by indexing a setting of 1800 meters into a computer. While the standard to be met (1800 meters) is indicated, it does not serve as a cue to the recall of technical information required in using the computer. Indeed, the verbalization "1800" must be recognized as a computer setting.

Performance and Frequency on Subtests for Supply Specialists in Non-Category IV Group

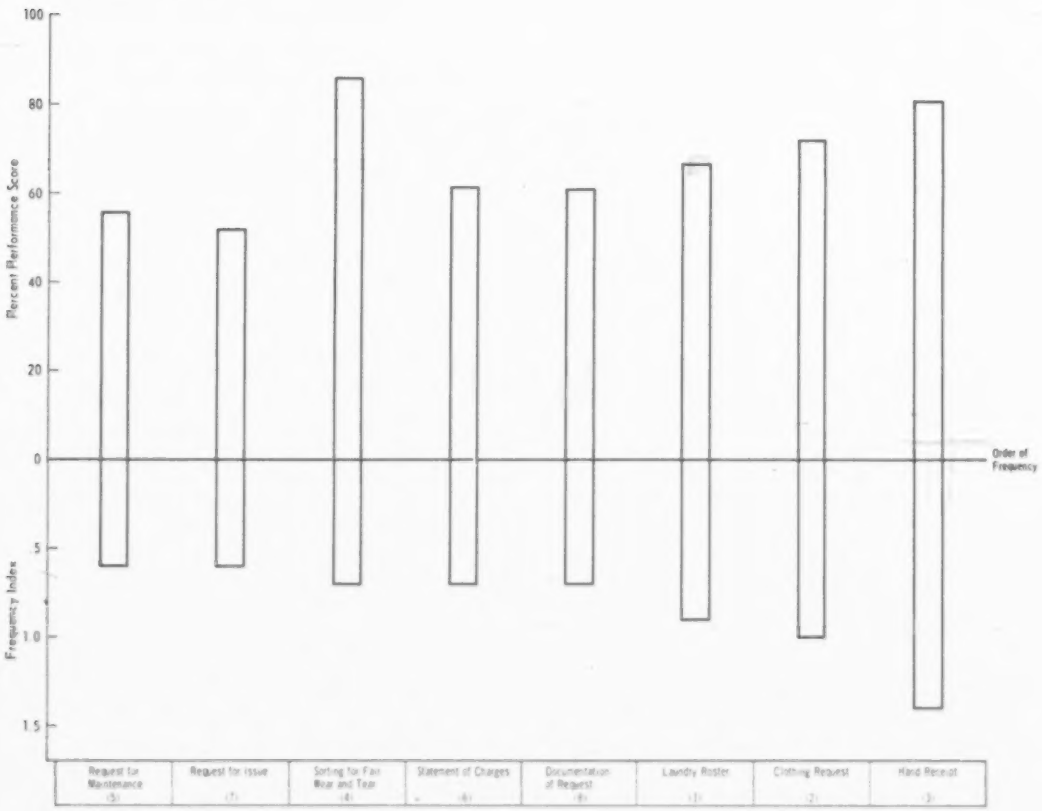

Figure 57

In each MOS, with the exception of Repairman, mean scores are higher in categories of lesser complexity. The partial lack of order in the Repairman is due, in part, to the special problem encountered in this MOS in assigning Job Sample steps to categories. The particular demands presented by any step in the Job Sample tests depended upon whether or not a reference manual was used. If a manual was used, a step or a standard might be named. If a manual was not used, the same step or standard would be un-specified. Therefore, steps had to be categorized for both situations.

While it was possible to categorize each step for either option, it had to be assumed that if a man used the manual at all during a subtest he used it for all steps of that subtest. While this assumption undoubtedly introduced considerable error, there was no other choice. To independently establish manual usage for each step would have required continuous questioning by the test administrator. This was not done because it would have created a highly artificial situation.

Performance and Frequency on Subtests for Cooks in Category IV Group

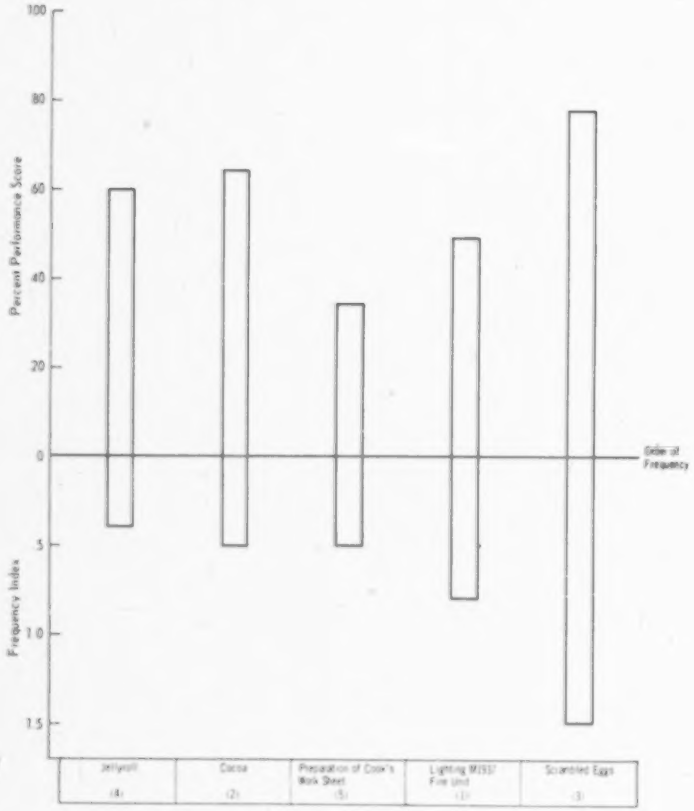

Figure 58

Performance and Frequency on Subtests for Cooks in Non-Category IV Group

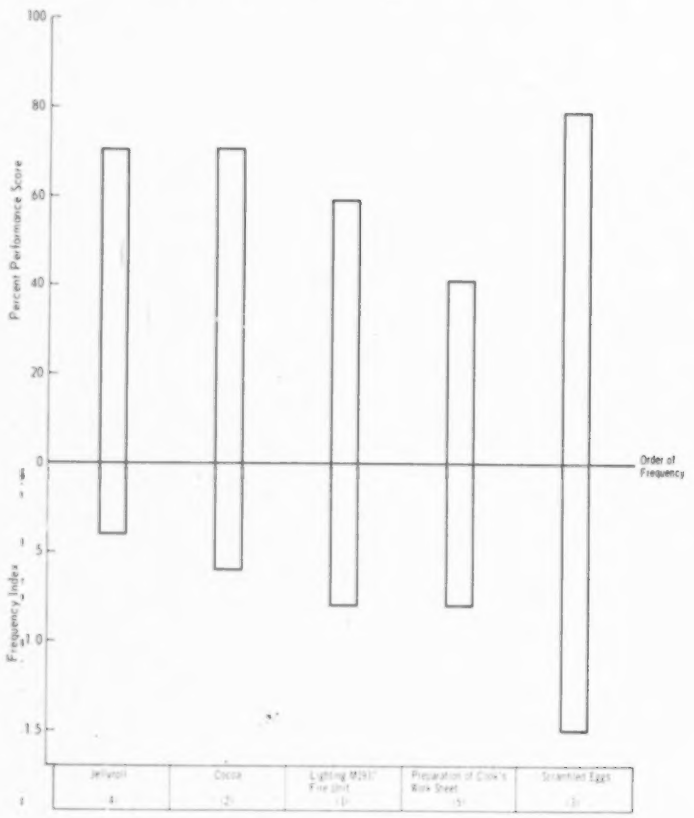

Figure 59

Table 28

Rank Order Correlations Between Frequency and Performance on Job Sample Subtests[a]

MOS	Category IV	Non-Category IV	*df*
Armor Crewman	.13	.06	18
Repairman	.57*	.74*	11
Supply Specialist	.67	.59	6
Cook	.20	.20	3

[a]*Indicates statistical significance ($p < .05$)

Table 29

Mean Performance in Two Sets of Behavioral Categories in Order of Complexity
(Percent)

Category	Armor Crewman	Repairman	Supply Specialist	Cook
N	80.5	65.7	64.1	68.9
NS		65.8		61.7
NK_2S	76.2	59.0		
NK_2	63.3	64.0	57.4	53.2
NK_2I		59.7	34.2	
K_1	68.5	74.9	63.0	69.8
K_1K_2	67.3	71.0	45.3	34.8
K_1K_2S	63.8	52.6		
$K_1K_2K_3$	55.7	62.0		

Table 30 shows Armor Crewman performance in the two sets of behavior categories for Category IVs and Non-Category IVs. The other MOSs will not be considered further in this analysis. Repairman has been eliminated for the reasons stated above, Supply Specialist and Cook because so few categories are represented in these MOSs.

In each behavior category, without exception, Non-Category IVs outperform the Category IVs. This is not surprising because, on the basis of the general performance of these groups seen previously, this would be expected—regardless of the adequacy of the classification system. (Any random set of steps taken from the entire Job Sample test would presumably show this difference.) While it is not shown, the same difference between Category IVs and Non-Category IVs occurs consistently in the other MOSs.

Table 30

Performance of Armor Crewmen in Two Mental Groupings in Two Sets of Behavior Categories

(Percent)

Category	Category IV	Non-Category IV	Difference
N	74.7	86.3	11.6
NK_2S	71.7	80.8	9.1
NK_2	59.6	67.1	7.5
K_1	65.7	71.3	5.6
K_1K_2	63.4	71.2	7.8
K_1K_2S	59.6	68.0	8.4
$K_1K_2K_3$	49.0	62.4	13.4

As shown in Table 29 for the combined groups, the level of performance of Category IVs and Non-Category IVs decreases as complexity increases. Additionally, for the K_1 set the difference between Category IVs and Non-Category IVs increases as complexity increases. This relationship had been anticipated for both the K_1 set and the N set. The authors have found no compelling explanation for the reversal in the N set.[1] The increasing difference between Category IVs and Non-Category IVS in the K_1 set as complexity increases is analagous to the increasing differences between these groups on tests of increasing difficulty as noted earlier. That is, differences in the performance of Category IVs and Non-Category IVs increase both as a function of empirically determined difficulty and in the K_1 set as a function of rationally determined complexity.

ANALYSIS OF JOB DUTIES

During the collection of criterion data, questionnaires were administered to subjects and supervisors in order to determine the typical job activities of all persons in the sample (2).

Armor Crewmen. Tables 31 and 32 show the percentage of Armor Crewman at each of five AFQT levels and five MOJ levels who report performing particular classes

[1] A large difference in performance between IVs and Non-IVs can be observed in the two categories which empirically are the easiest, N and NK_2S for Armor Crewman. It is possible, given representation of a full range of complexity, that if differences between IVs and Non-IVs are plotted along the complexity dimension, a U-shaped curve results. That is, where IVs and Non-IVs are compared on extremely simple tasks there may be a fairly sizable difference between them since all Non-IVs might be expected to perform such tasks successfully. When compared on tasks of intermediate complexity the difference between groups would be reduced since some Non-IVs would be unable to perform them. Finally, with tasks that are quite complex the difference would increase because many IVs would fail. Unfortunately, such a hypothesis cannot be tested in the other MOSs of the present study. In Armor Crewman, the N and NK_2S categories are presumably quite simple, that is, between 81 and 86% of the Non-IVs passed such items. No category in any of the other MOSs proved as simple.

Table 31

Occurrence of Job Duties Reported by Job Incumbents of Different AFQT Groups—Armor Crewmen

(Percent)

Job Duties Performed	AFQT Groupings				
	0-20 (N=97)	21-30 (N=93)	31-47 (N=62)	48-64 (N=65)	65+ (N=63)
(1) Preventive Maintenance—Checking	28	19	18	26	21
(2) Preventive Maintenance—Replacing	28	18	16	29	16
(3) Preventive Maintenance—Repairing	14	4	6	3	3
(4) Preventive Maintenance—Servicing	28	26	26	38	21
(5) Preventive Maintenance—Cleaning	41	49	44	45	49
(6) Preventive Maintenance—Supervision	1	9	0	9	5
(7) Practical Exercise—Teaching	0	1	3	3	0
(8) Practical Exercise—Attending	4	2	5	6	6
(9) Tank Gunnery—Teaching	1	5	3	2	3
(10) Tank Gunnery—Attending	8	9	11	9	13
(11) Job Non-related Details	9	10	8	8	13
(12) Work Details	10	3	11	9	13
(13) Crew Duties—Entire Crew	4	6	8	11	13
(14) Crew Duties—Single Crew	6	4	6	8	8

Table 32

Occurrence of Job Duties Reported by Job Incumbents of Different MOJ Groups—Armor Crewmen

(Percent)

Job Duties Performed	MOJ Grouping				
	0-3 (N=37)	4-9 (N=72)	10-15 (N=61)	16-24 (N=68)	25+ (N=142)
(1) Preventive Maintenance—Checking	14	26	21	21	25
(2) Preventive Maintenance—Replacing	11	32	26	19	19
(3) Preventive Maintenance—Repairing	5	11	5	6	6
(4) Preventive Maintenance—Servicing	16	32	33	21	30
(5) Preventive Maintenance—Cleaning	38	51	57	53	36
(6) Preventive Maintenance—Supervision	0	0	0	0	13
(7) Practical Exercise—Teaching	0	0	0	1	3
(8) Practical Exercise—Attending	3	3	5	7	4
(9) Tank Gunnery—Teaching	0	1	3	0	6
(10) Tank Gunnery—Attending	35	6	11	4	7
(11) Job Non-related Details	3	1	10	19	11
(12) Work Details	3	10	5	12	11
(13) Crew Duties—Entire Crew	16	4	5	7	9
(14) Crew Duties—Single Crew	14	4	10	3	6

of job duties. In general, the preventive maintenance activities are the most frequently performed. Apart from a higher incidence of parts replacement during preventive maintenance in the 4 to 15 MOJ range, no particular differences across AFQT or MOJ groups are evident in the frequently performed activities.

Examination of the less frequently performed tasks indicates:

(1) While men in all AFQT groups supervise preventive maintenance, this activity is only performed by men who have been in the job more than two years.

(2) Men who are in their first three months on the job attend practical exercises in tank gunnery with a much higher frequency than other Armor Crewmen. Of these, there is a slight tendency for Non-Category IVs to be more frequently represented.

(3) There is a positive relationship between AFQT and assignment to crew duties involving the entire tank crew (e.g., firing the main gun).

Tables 33 and 34 show supervisor estimates of the percentage of Armor Crewmen in the different AFQT and MOJ groupings performing the different job duties. It will be noted that supervisors and job incumbents do not agree completely on the frequency with which different tasks are performed. This lack of agreement will be observed subsequently in the other MOSs as well.

Examination of the patterning of job duties reported for incumbents by supervisors suggests that supervisors are sensitive to differences in AFQT and MOJ and seem to respond in a somewhat stereotyped manner with respect to these differences. For example, job incumbents regardless of AFQT report approximately the same frequency of assignment to work details whereas supervisors report more often that work details are carried out by Category IVs. Also, while job incumbents who have been in the job 1 to 24 months report no occasions in which they supervise preventive maintenance activities, supervisors report that starting with 4 to 9 months on the job a consistently increasing percentage of men supervise preventive maintenance activities.

Because supervisor estimates appear to be somewhat stereotyped and because the incumbent is viewed as providing more accurate information, supervisor estimates will in general not be discussed unless they provide particularly striking information.

Repairman. Tables 35, 36, 37, and 38 report similar information for Repairmen. The most frequently performed activity reported by Repairmen is parts replacement and repair. Other high frequency activities are job-related details, inspection of equipment, and log book maintenance and reports. Parts replacement and repair is reported most often by men in Category IV. It should be noted that supervisors agree with incumbents on the relative frequency with which the Category IVs as a group perform this activity. These observations are consistent with the rather high level of performance on the Job Sample test, as noted earlier, among Repairmen in the 0-20 AFQT group with two years and more of job experience. Job-related details, the next most frequently performed activity, is carried out more often by Non-Category IVs. Log book maintenance and reports are more frequently the responsibility of men with more than two years of job experience.

Examination of the less frequently performed tasks in the Repairman MOS indicates:

(1) No particular patterns or relationships are evident between AFQT and frequency of performing an activity.

(2) Maintenance supervision is most commonly done by men with more than two years of job experience.

(3) Scheduled maintenance and non-job related details are less frequently done by men with more than two years of job experience.

Table 33

Occurrence of Job Duties Reported by Supervisors for Different AFQT Groups—Armor Crewmen

(Percent)

Job Duties Performed	AFQT Groupings				
	0-20 (N=97)	21-30 (N=93)	31-47 (N=62)	48-64 (N=65)	65+ (N=63)
(1) Preventive Maintenance—Checking	6	3	6	6	2
(2) Preventive Maintenance—Replacing	1	3	5	3	2
(3) Preventive Maintenance—Repairing	0	0	0	5	3
(4) Preventive Maintenance—Servicing	44	30	35	29	32
(5) Preventive Maintenance—Cleaning	16	5	8	15	10
(6) Preventive Maintenance—Supervision	11	19	10	22	22
(7) Practical Exercise—Teaching	4	9	6	6	11
(8) Practical Exercise—Attending	0	2	0	5	2
(9) Tank Gunnery—Teaching	0	4	0	0	0
(10) Tank Gunnery—Attending	2	0	3	3	0
(11) Job Non-related Details	5	5	3	2	3
(12) Work Details	4	1	0	5	3
(13) Crew Duties—Entire Crew	1	1	3	0	0
(14) Crew Duties—Single Crew	42	37	27	37	35

Table 34

Occurrence of Job Duties Reported by Supervisors for Different MOJ Groups—Armor Crewmen

(Percent)

Job Duties Performed	MOJ Groupings				
	0-3 (N=37)	4-9 (N=72)	10-15 (N=61)	16-24 (N=68)	25+ (N=142)
(1) Preventive Maintenance—Checking	5	7	8	6	1
(2) Preventive Maintenance—Replacing	11	4	3	1	0
(3) Preventive Maintenance—Repairing	11	1	0	0	0
(4) Preventive Maintenance—Servicing	27	43	38	31	33
(5) Preventive Maintenance—Cleaning	14	21	20	10	2
(6) Preventive Maintenance—Supervision	0	4	7	16	32
(7) Practical Exercise—Teaching	3	3	3	4	13
(8) Practical Exercise—Attending	0	0	0	3	3
(9) Tank Gunnery—Teaching	0	0	0	0	3
(10) Tank Gunnery—Attending	0	3	2	0	2
(11) Job Non-related Details	0	10	2	1	4
(12) Work Details	0	6	3	1	2
(13) Crew Duties—Entire Crew	5	1	0	1	0
(14) Crew Duties—Single Crew	49	29	39	47	30

Table 35

Occurrence of Job Duties Reported by Job Incumbents of Different AFQT Groups—Repairmen

(Percent)

Job Duties Performed	AFQT Groupings				
	0-20 (N=92)	21-30 (N=103)	31-47 (N=64)	48-64 (N=74)	65+ (N=57)
(1) Supervision of Maintenance	7	7	8	4	4
(2) Maintenance Training—Attending	0	1	0	0	2
(3) Maintenance Training—Teaching	2	5	3	4	2
(4) Log Book Maintenance and Reports	13	15	20	19	11
(5) Troubleshooting	2	5	3	1	9
(6) Parts Replacement and Repair	62	72	50	55	58
(7) Combination 5 & 6	3	2	2	0	4
(8) Scheduled Maintenance	13	6	11	7	5
(9) Inspection of Equipment	17	15	23	14	12
(10) Job-Related Details	26	20	39	47	46
(11) Job Non-Related Details	5	5	3	1	4
(12) Work Details	3	0	2	0	0

Table 36

Occurrence of Job Duties Reported by Job Incumbents of Different MOJ Groups—Repairmen

(Percent)

Job Duties Performed	MOJ Groupings				
	0-3 (N=65)	4-9 (N=97)	10-15 (N=53)	16-24 (N=93)	25+ (N=82)
(1) Supervision of Maintenance	5	3	6	1	16
(2) Maintenance Training—Attending	0	0	0	2	0
(3) Maintenance Training—Teaching	5	1	4	0	9
(4) Log Book Maintenance and Reports	12	10	8	12	33
(5) Troubleshooting	6	2	0	4	6
(6) Parts Replacement and Repair	55	60	64	70	54
(7) Combination 5 & 6	3	2	2	0	4
(8) Scheduled Maintenance	11	9	8	12	2
(9) Inspection of Equipment	14	22	13	15	15
(10) Job-Related Details	42	25	26	34	41
(11) Job Non-Related Details	3	7	6	3	0
(12) Work Details	0	3	0	1	0

Table 37

Occurrence of Job Duties Reported by Supervisors for Different AFQT Groups—Repairmen

(Percent)

Job Duties Performed	AFQT Groupings				
	0-20 (N=92)	21-30 (N=103)	31-47 (N=64)	48-64 (N=74)	65+ (N=57)
(1) Supervision of Maintenance	18	27	33	26	35
(2) Maintenance Training—Attending	3	1	0	1	2
(3) Maintenance Training—Teaching	4	2	2	5	4
(4) Log Book Maintenance and Reports	10	13	19	18	12
(5) Troubleshooting	0	5	5	3	5
(6) Parts Replacement and Repair	20	25	22	15	12
(7) Combination 5 & 6	11	16	8	12	11
(8) Scheduled Maintenance	16	13	17	9	14
(9) Inspection of Equipment	13	18	16	11	18
(10) Job-Related Details	32	24	20	28	19
(11) Job Non-Related Details	7	4	2	4	4
(12) Work Details	2	0	0	0	0

Table 38

Occurrence of Job Duties Reported by Supervisors for Different MOJ Groups—Repairmen

(Percent)

Job Duties Performed	MOJ Groupings				
	0-3 (N=65)	4-9 (N=97)	10-15 (N=53)	16-24 (N=93)	25+ (N=82)
(1) Supervision of Maintenance	17	10	30	28	51
(2) Maintenance Training—Attending	3	3	2	0	0
(3) Maintenance Training—Teaching	2	0	0	8	6
(4) Log Book Maintenance and Reports	17	12	4	10	24
(5) Troubleshooting	3	3	2	3	5
(6) Parts Replacement and Repair	25	22	19	19	13
(7) Combination 5 & 6	15	13	9	9	12
(8) Scheduled Maintenance	20	13	17	11	11
(9) Inspection of Equipment	9	11	21	17	18
(10) Job-Related Details	20	28	30	28	21
(11) Job Non-Related Details	0	6	6	4	4
(12) Work Details	0	2	0	0	0

Table 39

Occurrence of Job Duties Reported by Job Incumbents of Different AFQT Groups—Supply Specialists

(Percent)

Job Duties Performed	AFQT Groupings				
	0-20	21-30	31-47	48-64	65+
(1) Preparing Common Forms and Reports	28	37	32	37	36
(2) Preparing Critical Forms and Reports	6	3	3	3	8
(3) Typing	11	9	18	14	13
(4) Posting Publications	3	1	2	0	1
(5) General Filing	4	2	2	3	3
(6) Editing Critical Reports and Documents	0	3	2	3	4
(7) Editing Common Reports and Documents	8	4	0	2	4
(8) Preparing for IG or Command Maintenance	3	7	3	3	8
(9) Preparing for Routine Inspections	8	5	8	7	4
(10) Supervising Supply Operations	0	4	2	7	0
(11) General Supervision of Work Details	1	0	3	3	0
(12) Minor Supervision	0	2	2	0	4
(13) Inspecting for Maintenance of Equipment	3	11	8	3	1
(14) Inspecting for Cleanliness	7	6	10	3	3
(15) Inspecting for Conservation of Utilities	0	2	0	0	1
(16) Maintaining Property Books	0	7	2	5	5
(17) Maintaining Document Register, Permanent Hand Receipts and Clothing Records	22	20	13	22	31
(18) Maintaining Temporary Records	6	4	8	3	8
(19) Handling Supplies	65	57	63	61	45
(20) Inventory, Complex	8	9	13	8	14
(21) Inventory, Simple	3	5	2	3	5
(22) Maintenance of Vehicles	13	21	15	8	12
(23) Driving	8	9	5	7	4
(24) NCO Duties, Job Non-Related	4	1	0	2	6
(25) Non-NCO Duties, Job Non-Related	9	5	5	8	3
(26) Practical Exercise—Attending	10	2	2	0	1
(27) Practical Exercise—Teaching	0	0	0	2	0

Supply Specialist. Tables 39, 40, 41, and 42 provide job duties information for Supply Specialists. The most frequently performed duties, in order of occurrence, are handling supplies; preparing common forms and reports; maintaining document registers, permanent hand receipts, and clothing records; maintenance of vehicles; and typing. Among these activities no striking relationships with AFQT are observed. Maintaining documents registers, and so forth, is more frequently the responsibility of men who have been in the job 16 or more months. Both maintenance of vehicles and typing decrease in frequency as job experience accumulates.

Examination of the less frequently performed tasks indicates:

(1) No particular patterns or relationships between AFQT and frequency of performing.

Table 40

Occurrence of Job Duties Reported by Job Incumbents of Different MOJ Groups—Supply Specialists

(Percent)

Job Duties Performed	MOJ Groupings				
	0-3 (N=40)	4-9 (N=151)	10-15 (N=63)	16-24 (N=49)	25+ (N=93)
(1) Preparing Common Forms and Reports	30	26	35	43	42
(2) Preparing Critical Forms and Reports	5	2	3	10	8
(3) Typing	20	15	11	12	5
(4) Posting Publications	5	1	3	0	1
(5) General Filing	2	3	2	4	2
(6) Editing Critical Reports and Documents	0	1	5	4	3
(7) Editing Common Reports and Documents	2	5	2	2	6
(8) Preparing for IG or Command Maintenance	0	4	10	2	8
(9) Preparation for Routine Inspections	8	8	11	4	1
(10) Supervising Supply Operations	0	2	2	0	5
(11) General Supervision of Work Details	0	1	0	2	3
(12) Minor Supervision	0	1	2	2	3
(13) Inspecting for Maintenance of Equipment	5	7	5	8	3
(14) Inspecting for Cleanliness	5	11	6	0	1
(15) Inspecting for Conservation of Utilities	0	2	0	0	0
(16) Maintaining Property Books	0	2	0	2	12
(17) Maintaining Document Register, Permanent Hand Receipts and Clothing Records	18	15	19	33	32
(18) Maintaining Temporary Records	5	3	6	12	8
(19) Handling Supplies	55	62	60	55	54
(20) Inventory, Complex	8	8	6	12	17
(21) Inventory, Simple	12	5	0	0	2
(22) Maintenance of Vehicles	20	17	17	12	7
(23) Driving	5	9	8	8	2
(24) NCO Duties, Job Non-Related	2	3	3	2	3
(25) Non-NCO Duties, Job Non-Related	5	9	6	4	2
(26) Practical Exercise—Attending	5	3	6	4	1
(27) Practical Exercise—Teaching	0	0	0	0	1

(2) Working on Reports of Survey, and so forth, is almost never done during the first nine months on the job.

(3) Supervision of Supply Operations is generally done by men with more than two years of job experience.

(4) Frequency of performing Minor Supervisory Tasks increases with time on the job.

(5) Maintaining Property Books is almost always a task for men with more than two years of job experience.

Table 41

Occurrence of Job Duties Reported by Supervisors for Different AFQT Groups—Supply Specialists

(Percent)

Job Duties Performed	AFQT Groupings				
	0-20 (N=100)	21-30 (N=98)	31-47 (N=62)	48-64 (N=59)	65+ (N=77)
(1) Preparing Common Forms and Reports	17	21	18	31	22
(2) Preparing Critical Forms and Reports	3	1	0	5	0
(3) Typing	6	10	11	14	16
(4) Posting Publications	2	0	2	2	0
(5) General Filing	1	1	0	2	6
(6) Editing Critical Reports and Documents	0	1	0	0	1
(7) Editing Common Reports and Documents	0	3	3	0	3
(8) Preparing for IG or Command Maintenance	1	1	0	0	0
(9) Preparation for Routine Inspections	2	3	5	3	6
(10) Supervising Supply Operations	4	10	16	17	12
(11) General Supervision of Work Details	3	2	0	0	3
(12) Minor Supervision	2	4	2	0	4
(13) Inspecting for Maintenance of Equipment	7	1	3	0	3
(14) Inspecting for Cleanliness	5	1	3	0	1
(15) Inspecting for Conservation of Utilities	0	1	0	2	0
(16) Maintaining Property Books	4	7	3	5	8
(17) Maintaining Document Register, Permanent Hand Receipts and Clothing Records	23	22	27	2	32
(18) Maintaining Temporary Records	3	2	3	2	3
(19) Handling Supplies	38	41	42	39	31
(20) Inventory, Complex	3	2	2	3	8
(21) Inventory, Simple	1	0	2	0	1
(22) Maintenance of Vehicles	5	3	2	5	5
(23) Driving	16	10	8	12	8
(24) NCO Duties, Job Non-Related	2	4	2	5	4
(25) Non-NCO Duties, Job Non-Related	2	0	2	0	1
(26) Practical Exercise—Attending	0	0	0	0	0
(27) Practical Exercise—Teaching	0	0	0	0	0

(6) Simple inventory tasks are more frequently performed by men during their first nine months on the job, whereas complex inventories are most frequently performed by men with at least 16 months of job experience.

Cooks. Tables 43, 44, 45 and 46 provide job duties information for Cooks. The most frequently performed duties, in order of occurrence, are cooking meat, fish, or poultry; preparing hot and cold breakfasts; baking; cleaning or disassembling fixed equipment; preparing beverages; and preparing raw ingredients.

Men in the 1-9 month combination report preparing meat, and so forth, more frequently, and men in the 1-15 months range prepare breakfast more often. Men with

Table 42

Occurrence of Job Duties Reported by Supervisors for Different MOJ Groups—Supply Specialists

(Percent)

Job Duties Performed	MOJ Groupings				
	0-3 (N=40)	4-9 (N=151)	10-15 (N=63)	16-24 (N=49)	25+ (N=93)
(1) Preparing Common Forms and Reports	15	18	32	29	18
(2) Preparing Critical Forms and Reports	0	3	2	0	1
(3) Typing	15	11	14	14	5
(4) Posting Publications	2	1	2	0	1
(5) General Filing	0	1	8	2	0
(6) Editing Critical Reports and Documents	0	1	0	0	1
(7) Editing Common Reports and Documents	5	1	2	2	2
(8) Preparing for IG or Command Maintenance	2	0	0	2	0
(9) Preparation for Routine Inspections	5	3	8	6	0
(10) Supervising Supply Operations	2	7	8	16	20
(11) General Supervision of Work Details	0	1	3	4	2
(12) Minor Supervision	0	1	2	2	6
(13) Inspecting for Maintenance of Equipment	0	5	3	2	1
(14) Inspecting for Cleanliness	5	3	2	4	0
(15) Inspecting for Conservation of Utilities	0	0	0	0	2
(16) Maintaining Property Books	0	3	3	2	16
(17) Maintaining Document Register, Permanent Hand Receipts and Clothing Records	27	22	33	24	25
(18) Maintaining Temporary Records	0	4	3	2	1
(19) Handling Supplies	32	46	32	35	33
(20) Inventory, Complex	5	3	5	2	4
(21) Inventory, Simple	0	2	0	0	0
(22) Maintenance of Vehicles	5	5	5	4	2
(23) Driving	12	16	14	4	4
(24) NCO Duties, Job Non-Related	2	2	6	6	2
(25) Non-NCO Duties, Job Non-Related	0	2	2	0	0
(26) Practical Exercise—Attending	0	0	0	0	0
(27) Practical Exercise—Teaching	0	0	0	0	0

more than two years of job experience clean or disassemble fixed equipment relatively infrequently. Men in the 31-47 AFQT group prepare beverages more frequently, but as experience on the job accumulates this task is undertaken less frequently. Supervisors indicate that Category IVs prepare raw ingredients more frequently although the statements of incumbents do not bear this out. Supervisors and incumbents agree, however, that men in the first three months on the job perform this task most frequently.

Examination of the less frequently performed tasks indicates:

(1) No particular patterns or relationships between AFQT and frequency of performing.

Table 43

Occurrence of Job Duties Reported by Job Incumbents of Different AFQT Groups—Cooks

(Percent)

Job Duties Performed	AFQT Groupings				
	0-20 (N=106)	21-30 (N=80)	31-47 (N=77)	48-64 (N=56)	65+ (N=54)
(1) Prepares Cook's Worksheet and Other Forms	7	22	10	20	24
(2) Inventory Food Products, Kitchen and Field Equipment	0	2	0	0	0
(3) Head Count and Collection of Money During Meal	2	1	1	2	0
(4) Determines Availability of Food, Glasses, Utensils, etc. During Meal	0	0	0	2	0
(5) Assigns Duties to Cooks and KPs	3	1	1	0	4
(6) Inspects Cooks and KPs for Personal Cleanliness	0	0	1	2	0
(7) Inspects Kitchen and Dining Area for Cleanliness	1	2	6	2	2
(8) Stores and Inspects Food	2	4	1	4	2
(9) Supervises Preparation and Serving of Food	8	15	10	7	11
(10) Supervises Cleaning Fixed Equipment and Movable Equipment	3	9	4	9	7
(11) Practical Exercise—Teaching	5	5	8	7	6
(12) Practical Exercise—Attending	0	1	0	0	0
(13) Prepares Beverages	17	15	25	12	1
(14) Prepares, Mixes, or Combines Raw Ingredients	20	15	18	7	19
(15) Cooks Meat, Fish, or Poultry	44	40	40	43	46
(16) Cooks Vegetables	0	0	0	0	2
(17) Cooks Potatoes and Pastes	2	0	1	2	4
(18) Prepares Foods	35	26	39	25	17
(19) Prepares Soups, Cooked Gravies, and Sauces	0	1	0	0	0
(20) Prepares Baked Products	17	11	14	25	13
(21) Prepares Desserts	0	0	0	0	0
(22) Sets up Dining Area (e.g., Fills Salt Shakers)	0	0	0	0	0
(23) Prepares Finished Food for Serving	4	1	3	2	4
(24) Serves Food	2	1	1	0	2
(25) Cleans or Disassembles Fixed Equipment	24	15	8	21	13
(26) Cleans Movable Equipment	0	0	0	0	2
(27) Cleans or Paints Kitchen or Mess Hall	12	9	14	9	4
(28) Sets up, Operates, and Maintains Field Mess Facilities	6	2	4	11	7
(29) Job Non-Related Details	1	5	1	4	0

Table 44

Occurrence of Job Duties Reported by Job Incumbents of Different MOJ Groups—Cooks

(Percent)

Job Duties Performed	MOJ Groupings				
	0-3 (N=90)	4-9 (N=151)	10-15 (N=28)	16-24 (N=54)	25+ (N=50)
(1) Prepares Cook's Worksheet and Other Forms	8	9	4	17	54
(2) Inventory Food Products, Kitchen and Field Equipment	0	0	0	2	2
(3) Head Count and Collection of Money During Meal	0	0	0	2	2
(4) Determines Availability of Food, Glasses, Utensils, etc. During Meal	1	0	0	0	0
(5) Assigns Duties to Cooks and KPs	1	1	0	4	4
(6) Inspects Cooks and KPs for Personal Cleanliness	0	0	0	2	2
(7) Inspects Kitchen and Dining Area for Cleanliness	0	2	0	0	14
(8) Stores and Inspects Food	0	4	4	2	2
(9) Supervises Preparation and Serving of Food	8	7	4	6	34
(10) Supervises Cleaning Fixed Equipment and Movable Equipment	0	7	7	7	12
(11) Practical Exercise—Teaching	3	5	0	11	10
(12) Practical Exercise—Attending	0	1	0	0	0
(13) Prepares Beverages	24	19	11	15	2
(14) Prepares, Mixes, or Combines Raw Ingredients	23	18	7	19	2
(15) Cooks Meat, Fish, or Poultry	47	51	36	39	18
(16) Cooks Vegetables	0	1	0	0	0
(17) Cooks Potatoes and Pastes	2	1	4	2	2
(18) Prepares Foods	42	31	43	19	8
(19) Prepares Soups, Cooked Gravies and Sauces	0	0	0	2	0
(20) Prepares Baked Products	13	16	29	15	14
(21) Prepares Desserts	0	0	0	0	0
(22) Sets up Dining Area (e.g., Fills Salt Shakers)	0	0	0	0	0
(23) Prepares Finished Food for Serving	4	3	4	2	0
(24) Serves Food	1	3	0	0	0
(25) Cleans or Disassembles Fixed Equipment	17	15	18	26	10
(26) Cleans Movable Equipment	0	1	0	0	0
(27) Cleans or Paints Kitchen or Mess Hall	10	11	18	13	2
(28) Sets up, Operates, and Maintains Field Mess Facilities	3	9	7	4	2
(29) Job Non-Related Details	1	1	7	2	4

Table 45

Occurrence of Job Duties Reported by Supervisors for Different AFQT Groups—Cooks

(Percent)

Job Duties Performed	AFQT Groupings				
	0-20 (N=106)	21-30 (N=80)	31-47 (N=77)	48-64 (N=56)	65+ (N=54)
(1) Prepares Cook's Worksheet and Other Forms	8	19	14	12	24
(2) Inventory Food Products, Kitchen and Field Equipment	0	0	0	0	0
(3) Head Count and Collection of Money During Meal	0	0	1	0	0
(4) Determines Availability of Food, Glasses, Utensils, etc. During Meal	0	0	0	0	0
(5) Assigns duties to Cooks and KPs	0	0	1	2	0
(6) Inspects Cooks and KPs for Personal Cleanliness	0	0	0	0	0
(7) Inspects Kitchen and Dining Area for Cleanliness	2	0	3	2	2
(8) Stores and Inspects Food	2	4	1	2	0
(9) Supervises Preparation and Serving of Food	14	26	16	27	26
(10) Supervises Cleaning Fixed Equipment and Movable Equipment	20	24	22	32	19
(11) Practical Exercise—Teaching	2	2	4	4	2
(12) Practical Exercise—Attending	3	1	1	0	2
(13) Prepares Beverages	2	2	1	5	2
(14) Prepares, Mixes, or Combines Raw Ingredients	18	20	9	11	9
(15) Cooks Meat, Fish, or Poultry	17	20	16	13	17
(16) Cooks Vegetables	7	10	5	7	4
(17) Cooks Potatoes and Pastes	3	5	1	2	4
(18) Prepares Foods	0	4	0	2	2
(19) Prepares Soups, Cooked Gravies and Sauces	3	1	3	0	0
(20) Prepares Baked Products	16	14	17	18	20
(21) Prepares Desserts	1	0	0	0	0
(22) Sets up Dining Area (e.g., Fills Salt Shakers)	0	0	0	0	0
(23) Prepares Finished Food for Serving	2	2	3	0	2
(24) Serves Food	3	0	3	4	2
(25) Cleans or Disassembles Fixed Equipment	2	0	0	0	2
(26) Cleans Movable Equipment	1	0	0	0	0
(27) Cleans or Paints Kitchen or Mess Hall	1	1	0	0	2
(28) Sets up, Operates, and Maintains Field Mess Facilities	7	5	12	5	7
(29) Job Non-Related Details	2	1	3	0	2

Table 46

Occurrence of Job Duties Reported by Supervisors for Different MOJ Groups—Cooks

(Percent)

Job Duties Performed	MOJ Groupings				
	0-3 (N=90)	4-9 (N=151)	10-15 (N=28)	16-24 (N=54)	25+ (N=50)
(1) Prepares Cook's Worksheet and Other Forms	7	9	18	19	40
(2) Inventory Food Products, Kitchen and Field Equipment	0	0	0	0	0
(3) Head Count and Collection of Money During Meal	1	0	0	0	0
(4) Determines Availability of Food, Glasses, Utensils, etc. During Meal	0	0	0	0	0
(5) Assigns Duties to Cooks and KPs	0	1	0	0	2
(6) Inspects Cooks and KPs for Personal Cleanliness	0	0	0	0	0
(7) Inspects Kitchen and Dining Area for Cleanliness	1	0	7	0	6
(8) Stores and Inspects Food	1	2	4	4	0
(9) Supervises Preparation and Serving of Food	7	19	14	28	48
(10) Supervises Cleaning Fixed Equipment and Movable Equipment	17	26	7	28	28
(11) Practical Exercise—Teaching	0	4	0	0	8
(12) Practical Exercise—Attending	4	1	0	0	0
(13) Prepares Beverages	6	1	0	4	0
(14) Prepares, Mixes, or Combines Raw Ingredients	24	13	11	6	10
(15) Cooks Meat, Fish, or Poultry	11	19	21	19	16
(16) Cooks Vegetables	12	6	0	6	4
(17) Cooks Potatoes and Pastes	1	4	0	6	2
(18) Prepares Foods	2	1	0	2	0
(19) Prepares Soups, Cooked Gravies and Sauces	0	2	4	4	0
(20) Prepares Baked Products	12	20	21	20	8
(21) Prepares Desserts	0	0	4	0	0
(22) Sets up Dining Area (e.g., Fills Salt Shakers)	0	0	0	0	0
(23) Prepares Finished Food for Serving	2	1	0	4	2
(24) Serves Food	4	1	0	4	0
(25) Cleans or Disassembles Fixed Equipment	1	1	4	0	0
(26) Cleans Movable Equipment	0	0	4	0	0
(27) Cleans or Paints Kitchen or Mess Hall	2	0	0	2	0
(28) Sets up, Operates, and Maintains Field Mess Facilities	10	7	14	4	4
(29) Job Non-Related Details	2	1	4	2	2

(2) Preparation of the Cook's worksheet, supervising the preparation and serving of food, and inspecting the kitchen and dining area are done most frequently by men with more than two years in the job.

(3) Supervising cleaning of the kitchen and mess hall is done increasingly often by men with more time in the job.

(4) Instruction is more frequently given by men with more than 16 months in the job.

Based on the responses of job incumbents, there are very few tasks in which frequency of performance is related to a man's AFQT score. In the foregoing discussion, five instances were identified among a total of 82 job duties codes in which AFQT appeared to be related to the frequency with which tasks are performed. In contrast, 27 instances were observed where amount of job experience was clearly related to frequency of performance. Such an observation is, of course, not unexpected since some duties (for example, supervisory tasks) are clearly reserved for men with more experience and higher grade.

Evidence that men at all AFQT levels perform practically all tasks with equal frequency clearly does not indicate that all men perform equally well. It does suggest, however, that the performance of men at even the lower AFQT levels is generally considered satisfactory. If performance were not satisfactory, a selective process would inevitably occur which would distinguish, at the very least, the extremes of the AFQT distribution.

Chapter 3

COMPARISONS BETWEEN SPECIAL SUBGROUPS

Comparisons of the performance of special subgroups within the study were undertaken in order to provide information that was deemed to be of particular relevance for Army planners. Comparisons of performance were made between Negroes and Caucasions, inductees and enlistees, and men with formal and on-the-job training in their MOS.

COMPARISONS OF THE PERFORMANCE OF NEGROES AND CAUCASIONS

In the study, approximately 21% of the subjects were Negro. They differed quite distinctly from Caucasians with respect to the amount of time they had been in the Army. Of those men in the sample with up to two years in the Army, 17% were Negro; between two and six years, 21% were Negro; and beyond six years, 30% were Negro. The increase in the percentage of Negroes in the Army over time reflects their relatively higher rate of reenlistment.

In conjunction with more time in the Army, Negroes tended to have more experience in the job. Figure 60 (Table A-56 in Appendix A) shows the relative proportion of Negroes and Caucasians for five levels of time in the job for all MOSs combined. The difference between the Negro and Caucasian distributions is significant since time-in-the-job has been shown to be a critical determinant of job performance.

Negroes and Caucasians also differed in their distributions of AFQT scores, the other variable that has been discussed as a major determinant of job performance. Figure 61 (Table A-57 in Appendix A) shows the relative proportions of Negroes and Caucasians for five levels of AFQT for all MOSs combined. The proportion of Negroes diminishes steadily as AFQT scores increase.

With the general distributions of AFQT and MOJ being different for Negroes and Caucasians, and the effects of these differences being expected to operate in opposition with regard to performance in each group, it cannot be assumed that the performance of each group is similar or that the relationship between AFQT, MOJ, and performance revealed thus far for the combined sample are necessarily typical of each group separately.

Performance differences and relationships described thus far for the combined sample are more representative of the Caucasian subsample since this group has a considerably larger N. With fewer Negroes in the sample, it is especially important to examine Negro performance separately. A specific analysis of Negro performance would acquire added significance if, as some have speculated, their relative numbers were to increase in an All-Volunteer Army (7).

However, for separate MOSs the number of Negroes is small if analysis is to take into simultaneous account specific AFQT and MOJ levels. This shortcoming is critical at the higher AFQT levels where for some combinations of AFQT and MOJ representation of Negroes drops to zero. Accordingly, it is not feasible to present graphically the mean performance scores of Negroes and Caucasians for comparison of groups. Analysis and understanding of results for these two racial groups are dependent upon comparisons of

Percent of Negroes and Caucasians at Each of Five MOJ Periods

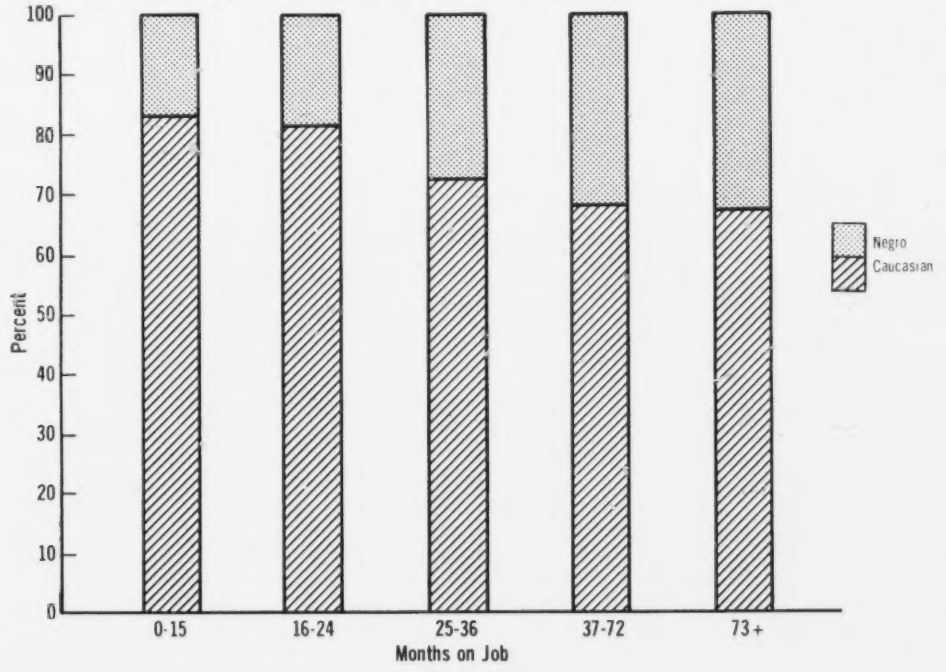

Figure 60

Percent of Negroes and Caucasians in Each of Five AFQT Levels

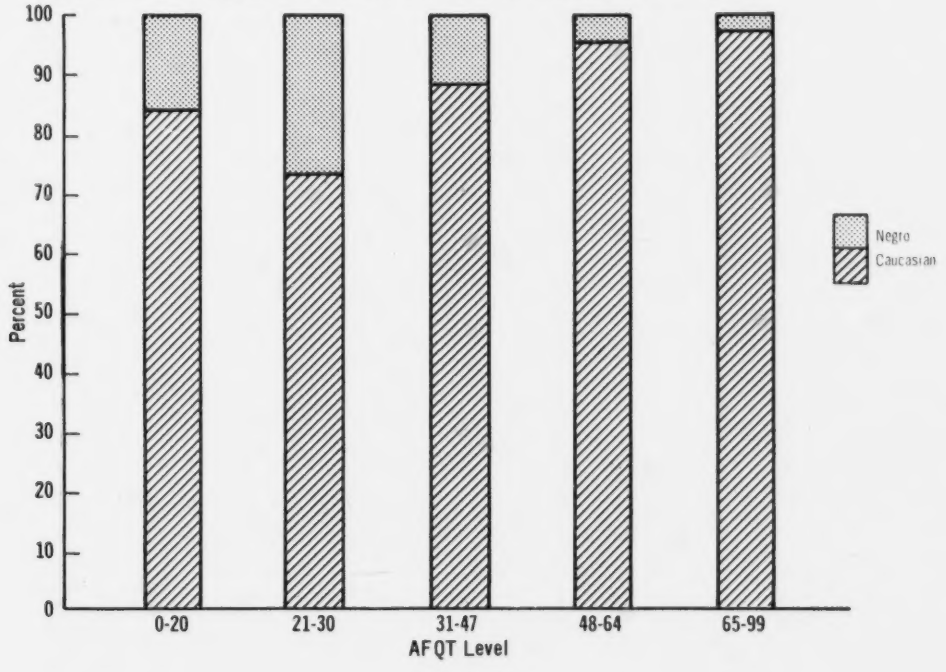

Figure 61

performance obtained through analyses of covariance, wherein the differences between the two subsamples on variables which might be presumed to have biasing effects are adjusted statistically.

PERFORMANCE ON JOB SAMPLE TESTS

Mean Job Sample scores and standard deviations are given in Table 47 for Negro and Caucasian subsamples for each MOS. Both the average performance and the variability for Negroes and Caucasians are almost identical in each MOS. In all cases, the minor differences between means were found not to be significant.

Table 47

Mean Scores on Job Sample Tests for Negroes and Caucasians

MOS	Ethnic Group	N	Mean Score	Standard Deviation	p^a
Armor Crewman	Negro	73	231.1	68.8	NS
	Caucasian	297	233.7	67.9	
Repairman	Negro	49	120.9	30.9	NS
	Caucasian	335	119.2	33.6	
Supply Specialist	Negro	91	91.9	23.4	NS
	Caucasian	298	93.1	24.1	
Cook	Negro	68	92.2	21.3	NS
	Caucasian	291	92.4	21.4	

[a]Probabilities refer to statistical significance of differences between means of Negroes and Caucasians.

The absence of any difference between these racial groups, a consistent finding in four different MOSs, provides strong evidence that the performance of Negroes and Caucasians, given their present AFQT and MOJ characteristics, is comparable across a range of jobs.

Having already observed that distributions of AFQT and MOJ are quite different for the two groups and having found in the combined sample that these variables are related to performance, the question of possible biasing effects still remains. Accordingly, a series of analyses of covariance were performed to examine the individual and combined effects of these variables on the two ethnic groups. As with the combined sample, where an adjustment is made for AFQT, education has also been covaried. Where adjustments are made for MOJ, age has also been covaried. In the succeeding discussion, references to AFQT and MOJ should be understood to mean AFQT and education, and MOJ and age.

The groups were compared with their performance means equated for the effects of MOJ and age, for the effects of AFQT and education, and for the effects of all four variables simultaneously. Table 48 presents the number of subjects per group and the mean score on each of the control variables used in the analyses of covariance.

The data are summarized in Table 49, which presents both adjusted and unadjusted means in percent form. The raw mean scores indicate, as noted previously, that with their present AFQT and MOJ characteristics the performance of Negroes and Caucasians does

Table 48

Negro and Caucasian Means on Control Variables Used in Analyses of Covariance

MOS	Ethnic Group	N	AFQT	MOJ	Education	Age
Armor Crewman	Negro	73	24.3	51.8	11.5	26.2
	Caucasian	297	42.2	33.9	11.1	23.4
Repairman	Negro	49	22.6	35.0	11.6	24.6
	Caucasian	335	41.1	20.8	11.0	22.5
Supply Specialist	Negro	91	24.6	27.9	11.9	25.4
	Caucasian	298	44.6	22.9	11.5	24.5
Cook	Negro	68	24.9	31.2	11.5	23.4
	Caucasian	291	40.3	21.8	11.3	22.4

Table 49

Mean Scores of Negroes and Caucasians on Job Sample Test for Raw and Adjusted Data[a]

(Percent)

MOS	Ethnic Group	Raw Mean Score	Variables Removed in Analysis		
			AFQT, Education, MOJ and Age	AFQT and Education	MOJ and Age
Armor Crewman	Negro	64	64	68	61*
	Caucasian	65	65	64	66
Repairman	Negro	69	70	73*	66
	Caucasian	68	67	67	68
Supply Specialist	Negro	59	61	62*	57
	Caucasian	60	59	59	60
Cook	Negro	58	60	61	58
	Caucasian	58	58	58	59

[a]*Refers to statistically significant differences between Negro and Caucasian means.

not differ. In the next column, where the effects of all four variables have been statistically controlled, again no differences between Negroes and Caucasians are demonstrated.

In the third column of data, where the effects of AFQT have been controlled but MOJ is still operating, Negro performance is reliably superior to that of Caucasians in two MOSs. These differences are attributable to a higher average time in the job of the Negro groups.

In the final column, where the effects of MOJ have been adjusted but AFQT is allowed to vary, Caucasian performance is reliably superior to that of Negroes in one MOS. This difference is attributable to a higher average AFQT of the Caucasian group.

By comparing scores of column 3 with scores in column 2 (which can be considered as representing baseline performance), it will be observed that the general effect of MOJ is to produce higher Negro means. Alternately, by comparing scores of column 4 with scores in column 2 it will be observed that the general effect of AFQT is to raise Caucasian means.

While differences in performance between Negroes and Caucasians do arise as a result of their dissimilar AFQT and MOJ distributions, these differences are not striking. Though there is a consistent pattern in the adjusted means, using either AFQT or MOJ, overall only three comparisons attain statistical significance.

The primary observation to be made from these analyses is that, for practical purposes, the present performance of Negroes and Caucasians in the Army, in the jobs studied, does not differ. It can also be stated with some certainty that if at some future time the AFQT and MOJ characteristics of these groups should be more alike, their performances at that time would also not differ (see Table 49, col. 2).

PERFORMANCE ON JOB KNOWLEDGE TESTS

Mean Job Knowledge scores for unadjusted and adjusted data are given in Table 50 in percent form for Negro and Caucasian subsamples in each MOS. In the first column of Table 50, where raw or unadjusted scores are compared, average Job Knowledge scores do not differ reliably in three of the four MOSs. In Armor Crewman, Caucasians score significantly higher than Negroes. In the second column, where the effects of all four variables have been statistically controlled, the only reliable difference in performance

Table 50

Mean Scores of Negroes and Caucasians on Job Knowledge Test for Raw and Adjusted Data[a]

(Percent)

MOS	Ethnic Group	Raw Mean Score	Variables Removed in Analysis		
			AFQT, Education, MOJ and Age	AFQT and Education	MOJ and Age
Armor Crewman	Negro	59*	61*	63	57*
	Caucasian	64	64	63	65
Repairman	Negro	43	44	47	41*
	Caucasian	46	46	46	46
Supply Specialist	Negro	54	55	59*	52
	Caucasian	53	52	51	53
Cook	Negro	47	49	50	46*
	Caucasian	50	49	49	50

[a]*Refers to statistically significant differences between Negro and Caucasian means.

again occurs in Armor Crewman. In the third column, where the effects of AFQT have been controlled but MOJ is operating, Negro performance is reliably superior to that of Caucasians in one MOS, Supply Specialist. This difference is attributable to a higher average time in the job of the Negro group.

In the fourth column of Table 50, where the effects of MOJ have been adjusted but AFQT varies, Caucasian performance is reliably superior to Negro performance in three MOSs. These differences are attributable to a higher average AFQT of the Caucasian group. As in the Job Sample test, the general effect of MOJ is to produce higher Job Knowledge means of the Negro groups, whereas the effect of AFQT is to produce higher Job Knowledge means of the Caucasian group.

While AFQT does not produce any striking differences between Negroes and Caucasians on Job Sample tests, it does appear to influence performance on paper-and-pencil tests of Job Knowledge. As discussed earlier, there is a stronger relationship between AFQT and Job Knowledge scores than between AFQT and Job Sample scores (see p. 31). Nevertheless, as the groups are presently constituted (with job experience favoring the Negro group and AFQT favoring the Caucasian group), in general the groups perform equally well. If at some future time their AFQT and MOJ characteristics should be more alike, their performance at that time would, in general, not be expected to differ.

SUPERVISOR EVALUATIONS

Supervisor ratings of Negroes and Caucasians did not differ, either for raw ratings or for any of the adjusted ratings as Table 51 shows.

Table 51

Mean Scores of Negroes and Caucasians on Supervisor Ratings for Raw and Adjusted Data

(Percent)

MOS	Ethnic Group	Raw Mean Score	Variables Removed in Analysis		
			AFQT, Education, MOJ and Age	AFQT and Education	MOJ and Age
Armor Crewman	Negro	70	67	69	66
	Caucasian	70	70	70	70
Repairman	Negro	70	70	72	68
	Caucasian	68	68	68	69
Supply Specialist	Negro	68	67	68	67
	Caucasian	70	70	70	70
Cook	Negro	65	65	67	64
	Caucasian	67	67	66	67

COMPARISONS OF THE PERFORMANCE OF INDUCTEES AND ENLISTEES

Criterion performance of inductees and enlistees was compared. These comparisons were limited to subjects who were in their first 23 months in the Army. This subsample consisted of a total of 606 inductees and 231 enlistees for all four MOSs combined.

Out of the 12 comparisons on Job Sample tests, Job Knowledge tests, and Supervisor Ratings, only one reliable difference was found. Inductee Cooks were rated higher than enlistee Cooks by supervisors, despite the fact that these groups were identical on the other two criteria as shown in Table 52.

Table 52

Means of Inductees and Enlistees on Three Criteria[a]
(Percent)

Group	Job Sample Test	Job Knowledge Test	Supervisor Ratings
Armor Crewman			
Inductees	54	56	68
Enlistees	56	58	62
Repairman			
Inductees	62	42	68
Enlistees	59	40	63
Supply Specialist			
Inductees	55	45	70
Enlistees	52	44	64
Cook			
Inductees	56	47	67*
Enlistees	56	47	59

[a]The pair of means that is marked by an asterisk differ significantly from one another ($p < .05$).

COMPARISONS OF MEN WITH FORMAL AND ON-THE-JOB TRAINING

In the study, approximately 53% of the subjects in their first two years in the Army had received formal training (Advanced Individual Training for Armor Crewman and Combat Support Training for Repairman, Supply Specialist, and Cook) in their MOS. The remainder had been assigned directly to their jobs following basic training and can be assumed to have received some variety of on-the-job training. The number of men in each MOS receiving formal or on-the-job training is given in Table 53.

To provide information on the effect of formal training, Job Sample test scores were compared for men in the sample with each variety of training experience. Comparisons were restricted to men within their first two years in the Army, since it is during this period that any differential effect due to training could be expected to have its major effect. Mean Job Sample scores of the formally trained and on-the-job trained groups were compared for Category IVs separately and Non-Category IVs separately, as well as for the combined AFQT groups. In these comparisons, as with others in the study, the

Table 53

Number and Percent of Formal and On-the-Job Trained Men With Two Years or Less Army Experience

MOS	Training	N	Percent
Armor Crewman	Formal	126	69.2
	On-the-Job	56	30.8
	Total	182	
Repairman	Formal	84	44.2
	On-the-Job	106	55.8
	Total	190	
Supply Specialist	Formal	70	34.7
	On-the-Job	132	65.3
	Total	202	
Cook	Formal	193	65.4
	On-the-Job	102	34.6
	Total	295	

effects of AFQT, education, months on the job, and age were controlled. Raw and adjusted means are shown in Table 54.

While in Repairmen, Supply Specialists, and Cooks there is a slight superiority of formally trained men, the adjusted means are reliably different only for Category IV Repairmen and all groups of Cooks. Clearly formal training does not appear to have a great effect on job performance. Perhaps for Cooks, where there is a consistent difference favoring all groups of formally trained men, the content of training is more closely related to actual job requirements as measured by the Job Sample test.

Table 54

Comparisons of Formal and On-the-Job Trained Subjects on Job Sample Test[a,b]

MOS	Category	Training	Raw Mean	Adjusted Mean[c]
Armor Crewman	Category IV[d]	Formal	176	178
		On-the-Job	180	174
	Non-Category IV	Formal	211	210
		On-the-Job	223	223
Repairman	Category IV	Formal	108	108*
		On-the-Job	90	90
	Non-Category IV	Formal	123	122
		On-the-Job	113	114
	Category IV and Non-IV Combined	Formal	116	115*
		On-the-Job	101	102
Supply Specialist	Category IV	Formal	80	80
		On-the-Job	74	75
	Non-Category IV	Formal	99	94
		On-the-Job	91	93
	Category IV and Non-IV Combined	Formal	87	87
		On-the-Job	83	83
Cook	Category IV	Formal	84	85*
		On-the-Job	78	77
	Non-Category IV	Formal	98	98*
		On-the-Job	86	86
	Category IV and Non-IV Combined	Formal	92	92*
		On-the-Job	81	82

[a]All subjects in the analyses were in their first two years in the Army.

[b]Comparisons are based upon Analyses of Covariance; AFQT education, MOJ, and age were controlled.

[c]* Indicates adjusted means which are reliably different.

[d]Means for the Category IV and Non-IV groups combined are not given because of the strong suggestion of an interaction between Category IVs and Non-IVs in the Armor Crewman MOS.

Chapter 4

AN ANALYSIS OF ACCEPTABLE PERFORMANCE

CRITERIA OF ACCEPTABLE PERFORMANCE BASED UPON JOB SAMPLE DATA

One of the continuing problems faced in manpower assessment is the establishment of criterion levels of job proficiency that have functional utility. Data of this study provide an opportunity to establish an empirically based, operational definition of job proficiency defined by performance on work sample tests.

Ideally, minimum satisfactory performance would be defined in terms of specific operational requirements. The present state of human factors technology, however, does not provide performance specifications that are sufficiently precise to allow this ideal to be achieved.

Examination of the scatter plots of job sample data suggests an alternative approach, a relative rather than absolute procedure for defining acceptable performance (see Figures 1-4). The scatter plots show a rather clearly defined floor of performance for men with more than 30 months of job experience. Here, most of the cases are seen to cluster in a rather narrow band of performance. Exceptions are seen in the 5-10% of the cases who are clearly deviant and fall below the floor. This band can be considered to represent, in effect, the range of normal and expected performance for experienced job incumbents.

Therefore, it appears reasonable to adopt the lower limit of this band as defining minimum acceptable performance. Minimum acceptable performance defined in this manner is a score of 71.0% or 255 points out of a possible 359 for Armor Crewman, 75.0% or 132 points out of 176 for Repairman, 54.5% or 85 points out of 156 for Supply Specialist, and 55.7% or 88 points out of 158 for Cooks.

With such a definition, approximately 5-10% of the job incumbents with 30 or more months of experience fall below minimum performance standards. With the total sample being divided equally into Category IVs and Non-Category IVs, it would be expected by chance that 50% of those below minimum acceptable performance would be Category IVs. The actual number is little higher—60%.

An additional observation can be made by projecting the band of acceptable performance to include men in the 1-30 MOJ period. Approximately 26% of the Category IV group and 45% of the Non-Category IV group perform above the minimum acceptable level during the first 18 months of job experience. Between 19-30 MOJ, approximately 51% of the Category IV and 77% of the Non-Category IV groups perform above this minimum level.

RELATIONSHIP BETWEEN ACCEPTABLE PERFORMANCE AND ELIGIBILITY TO REENLIST

At present, in order for a man to be eligible to reenlist in the Army at completion of his first tour of duty, he must possess at least three scores of 90 or better among eight

Aptitude Areas.[1] An analysis was undertaken to establish the relationship between the Army's requirements for reenlistment eligibility and acceptable performance on the Job Sample tests as defined in the previous section. Of those men in the study who had been in their jobs for 19 months (approximately two years in the Army) or less, how many who would be eligible to reenlist at the end of two years in the Army, could be expected to be performing above the level of minimum acceptability at that time? Conversely, how many men who could be expected to perform above minimum levels of acceptability at the end of two years in the Army would be eligible to reenlist?

To estimate a man's expected Job Sample test score at 19 months in the job, raw job sample scores for the entire sample were first transformed to standard scores with a mean of 50 and a standard deviation of 10. Using these scores, the average standardized score was then computed for each year of job experience. Parameters for a modified exponential equation were obtained separately for each job for Category IVs and Non-Category IVs.[2] These theoretical curves provided expected scores at any point in time. Expected scores for each man with 19 months or less in the job were then generated by making the assumption that a man would deviate from the expected score at 19 months in the job for his MOS by the same amount that he deviated from the expected score at his actual time in the job.

The percentages of Low Category IVs (AFQT scores 1-20), High Category IVs (AFQT scores 21-30), and Non-Category IVs (AFQT scores 31-99) in each MOS who were expected to be above and below minimum acceptable Job Sample performance at 19 months in the job and who were eligible or not eligible to reenlist are given in Table 55. Across MOSs, 48% of the Low IVs, 50% of the High IVs, and 69% of the Non-IVs would be expected to perform above the minimum acceptable performance level. Approximately two-fifths (19%/48%) of the effective performers in the Low IV group would not be eligible to reenlist, based upon Army standards for reenlistment. Approximately one-fifth (9%/50%) of the effective performers in the High IV group and a very small proportion (2%/69%) of the effective performers in the Non-IV group would not be permitted to reenlist. On the other hand, approximately three-fifths (30%/53%) of the ineffective performers in the Low IV group would be eligible to reenlist, and three-quarters (38%/49%) of the ineffective performers in the High IV group and almost all (30%/31%) of the Non-IV ineffective performers would be eligible under the Army's criterion for reenlistment. This analysis suggests that the use of the current reenlistment criterion tends to result in the rejection of a considerable proportion of effective performers in the low mental categories and the acceptance of a considerable proportion of ineffective performers in the higher mental categories.

[1] Aptitude Area scores are derived from Army Classification Battery (ACB) or Army Qualification Battery (AQB) aptitude test scores. The ACB or AQB is administered at the time of entry into the Army. Scores are in the Army standard score system with a mean of 100 and a standard deviation of 20.

[2] The analytic expression selected to fit the data is given by the equation:

$$z(t) = 80(1-\alpha_e-\beta\tau)$$

where t = time in the job

$z(t)$ = the standardized score corresponding to the raw score at time t

α, β = numerical parameters to be estimated from the data for each case (with a case being a specific job, AFQT level, and criterion measure)

80 = the value of the asymptote, selected as 3 standard deviations above the mean, to provide a constant asymptote for all cases.

Table 55

Status of AFQT Groups With Regard to UTILITY's Minimum Acceptable Level of Performance and the Army's Reenlistment Requirement[a]

(Subjects' first 2 years in Army and first 19 MOJ)

Group	N	Men Above Acceptable Minimum on Performance			Men Below Acceptable Minimum on Performance		
		JS^+ (%)	JS^+ & AA^+ (%)	JS^+ & AA^- (%)	JS^- (%)	JS^- & AA^+ (%)	JS^- & AA^- (%)
Low Category IV							
Armor Crewman	97	**47**	28	19	**53**	32	21
Repairman	92	**41**	38	3	**59**	43	16
Supply Specialist	100	**52**	31	21	**48**	20	28
Cook	108	**51**	19	32	**49**	23	26
Average		**48**	29	19	**53**	30	23
High Category IV							
Armor Crewman	93	**46**	40	6	**54**	43	11
Repairman	103	**35**	34	1	**63**	54	9
Supply Specialist	98	**53**	46	7	**43**	39	4
Cook	81	**64**	44	20	**35**	15	20
Average		**50**	41	9	**49**	38	11
Non-Category IV							
Armor Crewman	190	**55**	55	–	**44**	43	1
Repairman	195	**46**	46	–	**54**	54	–
Supply Specialist	198	**86**	86	–	**14**	13	1
Cook	189	**89**	81	8	**11**	8	3
Average		**69**	67	2	**31**	30	1

[a] JS^+ = above minimum acceptable job sample performance.

JS^- = below minimum acceptable job sample performance.

AA^+ = eligible to reenlist (three aptitude area scores 90 or better).

AA^- = not eligible to reenlist (failure to have three aptitude area scores above 90).

Chapter 5

USING JOB KNOWLEDGE SCORES TO SCREEN INEFFECTIVE PERFORMERS AT TIME OF FIRST REENLISTMENT

A variety of findings in this study suggest that it is reasonable for the Army to continue its present policy of accepting men at the lower AFQT levels because of (a) the great variability in performance at the outset of job experience; (b) the extreme overlap among aptitude groups in performance over the entire range of time in the job; and (c) the potential loss of large numbers of low aptitude men who perform as well as their counterparts with higher AFQT scores.

Rather than excluding low aptitude men from the military, it would appear reasonable for the Army to consider screening out those men who continue to perform in the lower ranges of the distribution after they have acquired some degree of job experience. While, for screening, tests such as the Job Sample measuring instruments used in the research would provide the most valid measures of a man's performance capability, such tests would be prohibitively expensive for operational use. However, a test modeled after the Job Knowledge test would appear to be an excellent candidate as an alternative screening instrument. Such tests, similar to existing Army proficiency tests in cost and administrative simplicity, correlated substantially with Job Sample tests study. These correlations had the additional virtue of remaining relatively high for the restricted Category IV and Non-Category IV subsamples, as shown in Tables 12 and 13.

The Job Knowledge test could be used to establish whether a man should be retained in the service in his job specialty. Screening, using Job Knowledge tests, could occur at the time of a man's first reenlistment. Job experience during an initial military tour appears to provide sufficient job exposure to give even the poorest performers an opportunity to learn and demonstrate their capabilities.

In the previous section, minimum acceptable levels of performance for men with considerable experience were discussed. The correlation between Job Knowledge scores and performance (i.e., Job Sample scores) can be used to predict the ratio of acceptable performers to unacceptable performers, that would be the case for any given minimum score set on the Job Knowledge test. A minimum Job Knowledge score can be set for retention by considering two factors: (a) the size of the manpower pool in relation to personnel requirements, and (b) the trade-off between risking rejection of acceptable performers and assuring that unacceptable performers are not retained.

Where personnel needs are minimal, high Job Knowledge cut-off points could be used that would tend to assure retention of few unacceptable performers, at the cost of rejecting some acceptable ones. When personnel needs are great, it would be possible to set lower levels in order to avoid losing some of the acceptable performers, at a cost of retaining a greater proportion of unacceptable performers.

It is believed that such a procedure is feasible and would provide an effective screening technique. Establishing the method on an operational basis would require construction of job sample tests in each MOS where screening is to occur. UTILITY data provide evidence that job sample tests requiring the performance of only a few tasks would be adequate for this purpose, but job knowledge and job sample data would need to be collected using a large sample of men who have spent approximately 18 months on the job (two years in the Army). To the extent that job knowledge items are common

across job families or clusters, it would be feasible to incorporate them into one test for the job cluster, thereby reducing the number of tests that would be needed.

While Proficiency Tests currently in use in the Army might be adapted as job knowledge tests, considerable care would be necessary in making the adaptation. To be used as screening instruments, job knowledge tests must correlate with job sample tests at least as well as those in the present study. Job knowledge tests used operationally in the Army vary greatly; many require information that is not directly related to job performance. Test items have often been developed by subject matter experts rather than job holders and tend to emphasize theory or nomenclature, rather than job specifics. If such tests were adopted directly as job knowledge tests, there is little evidence that correlations with job sample data would be high enough for the tests to serve adequately as screening instruments.

LITERATURE CITED
AND
APPENDICES

LITERATURE CITED

1. Vineberg, Robert, Taylor, Elaine N., Caylor, John S. *Performance in Five Army Jobs by Men at Different Aptitude (AFQT) Levels: 1. Purpose and Design of Study*, HumRRO Technical Report 70-18, November 1970.

2. Vineberg, Robert, Taylor, Elaine N., Sticht, Thomas G. *Performance in Five Army Jobs by Men at Different Aptitude (AFQT) Levels: 2. Development and Description of Instruments*, HumRRO Technical Report 70-20, November 1970.

3. Vineberg, Robert and Taylor, Elaine N. *Performance in Four Army Jobs by Men at Different Aptitude (AFQT) Levels: 4. Relationships Between Performance Criteria*, HumRRO Technical Report 72-23.

4. Winer, B.J. *Statistical Principles in Experimental Design*, McGraw-Hill, New York, 1962.

5. Vineberg, Robert, Sticht, Thomas G., Taylor, Elaine N., Caylor, John S. *Effects of Aptitude (AFQT), Job Experience and Literacy on Job Performance: Summary of HumRRO Work Units UTILITY and REALISTIC*, HumRRO Technical Report 71-1, February 1971.

6. Plag, John A., Goffman, Jerry M., Phelan, James D. *Predicting the Effectiveness of New Mental Standards Enlistees in the U.S. Marine Corps*, Report No. 71-42, Navy Medical Neuropsychiatric Research Unit, San Diego, California, December 1970.

7. "Panel Proposes All-Volunteer Army," *Armed Forces Journal*, 28 February 1970, pp. 12-13.

Appendix A

SUPPORTING DATA FOR FIGURES

Table A-1

Armor Crewman's Job Sample Score by Time on Job for AFQT Groups

(Percent)

Months on Job	AFQT Level		
	0-20	21-30	31-99
1- 3	39.1	43.4	51.4
4- 9	39.6	41.3	52.9
10-15	56.6	58.9	68.4
16-24	65.3	66.4	71.2
25-60	64.1	72.8	78.6
61+	75.7	82.6	82.9

Table A-2

Repairman's Job Sample Score by Time on Job for AFQT Groups

(Percent)

Months on Job	AFQT Level		
	0-20	21-30	31-99
1- 3	49.2	53.6	61.9
4- 9	54.6	57.4	69.8
10-15	58.9	64.8	72.8
16-24	61.3	69.8	73.5
25-60	83.0	72.0	79.8
61+	83.7	87.3	84.4

Table A-3

Supply Specialist's Job Sample Score by Time on Job for AFQT Groups

(Percent)

Months on Job	AFQT Level		
	0-20	21-30	31-99
1- 3	52.7	50.9	62.6
4- 9	49.2	49.7	56.8
10-15	46.8	55.3	64.6
16-24	51.9	65.5	68.7
25-60	58.2	62.8	72.4
61+	68.4	74.8	76.3

Table A-4

Cook's Job Sample Score by Time on Job for AFQT Groups

(Percent)

Months on Job	AFQT Level		
	0-20	21-30	31-99
1- 3	49.5	51.5	59.5
4- 9	50.0	55.9	58.0
10-15	50.3	56.4	64.9
16-24	54.8	53.2	65.8
25-60	50.2	60.3	58.7
61+	72.9	71.2	75.8

Table A-5

Armor Crewman's Job Sample Score by AFQT for Time-on-Job Groups

(Percent)

AFQT Level	Months on Job		
	1-9	10-24	25+
0-20	39.5	61.9	72.3
21-30	42.1	62.0	78.5
31-47	49.3	66.3	81.2
48-64	51.0	69.8	80.2
65-99	57.2	72.7	82.8

Table A-6

Repairman's Job Sample Score by AFQT for Time-on-Job Groups

(Percent)

AFQT Level	Months on Job		
	1-9	10-24	25+
0-20	52.6	60.3	83.4
21-30	55.8	68.2	77.9
31-47	66.2	67.2	76.7
48-64	62.5	76.5	82.1
65-99	73.5	75.9	88.7

Table A-7

Supplyman's Job Sample Score by AFQT for Time-on-Job Groups

(Percent)

AFQT Level	Months on Job		
	1-9	10-24	25+
0-20	50.0	48.6	60.9
21-30	50.0	59.2	68.6
31-47	54.2	63.0	74.7
48-64	56.0	65.3	74.3
65-99	62.7	69.5	73.4

Table A-8

Cook's Job Sample Score by AFQT for Time-on-Job Groups

(Percent)

AFQT Level	Months on Job		
	1-9	10-24	25+
0-20	49.8	53.1	64.4
21-30	54.3	54.2	69.2
31-47	57.3	62.6	73.4
48-64	56.7	66.9	72.6
65-99	62.4	67.2	75.6

Table A-9

Distribution of AFQT Groups With 1 to 18 Months-on-Job on Job Sample Tests (Four MOSs Combined)

(Percent)

Quarter[a]	AFQT Level			
	0-20	21-30	31-64	65+
High	12.2	16.4	28.8	45.2
High Middle	21.0	27.9	27.0	28.3
Low Middle	29.8	28.0	28.0	15.8
Low	37.0	27.8	16.3	9.0

[a]In relation to performance on Job Sample Test.

Table A-10

Distribution of AFQT Groups With 19 to 30 Months-on-Job on Job Sample Tests[a] (Four MOSs Combined)

(Percent)

Quarter	AFQT Level			
	0-20	21-30	31-64	65+
High	25.5	46.5	64.1	70.3
High Middle	33.3	23.9	21.8	24.3
Low Middle	27.4	22.5	12.8	2.7
Low	13.7	7.0	1.3	2.7

[a]In relation to quarters of 1-18 months-on-job subsample.

Table A-11

Distribution of AFQT Groups With 31+ Months-on-Job on Job Sample Tests[a] (Four MOSs Combined)

(Percent)

Quarter	AFQT Level			
	0-20	21-30	31-64	65+
High	71.8	77.6	84.2	90.0
High Middle	12.8	14.9	14.7	5.0
Low Middle	7.7	6.4	1.1	2.5
Low	7.7	1.1	0	2.5

[a]In relation to quarters of 1-18 months-on-job subsample.

Table A-12

Armor Crewman: Mean Percent of Subtests Completed With No Prompts or One Prompt[a]

AFQT Level	Months on Job				
	1-3	4-9	10-15	16-24	25+
0-20	44.9	40.6	62.0	67.6	73.5
21-30	44.4	39.9	62.6	71.4	82.0
31-99	55.5	53.6	72.7	72.9	85.1

[a]14 subtests

Table A-13

Repairman: Mean Percent of Subtests Completed With No Prompts or One Prompt[a]

AFQT Level	Months on Job				
	1-3	4-9	10-15	16-24	25+
0-20	29.9	39.2	49.7	51.8	81.2
21-30	33.7	45.7	47.9	59.3	71.7
31-99	46.9	57.2	62.9	64.9	77.6

[a]13 subtests

Table A-14

Armor Crewman: Mean Percent of Subtests Not Completed

AFQT Level	Months on Job				
	1-3	4-9	10-15	16-24	25+
0-20	46.4	50.3	29.9	19.6	16.1
21-30	43.6	48.5	25.8	15.1	9.9
31-99	36.9	35.9	18.1	15.7	5.6

Table A-15

Repairman: Mean Percent of Subtests Not Completed

AFQT Level	Months on Job				
	1-3	4-9	10-15	16-24	25+
0-20	49.8	40.1	35.5	29.5	8.5
21-30	41.4	35.9	32.5	23.9	14.1
31-99	30.9	19.9	20.8	18.1	7.1

Table A-16

Supply Specialist: Mean Percent of Critical Errors

AFQT Level	Months on Job				
	1-3	4-9	10-15	16-24	25+
0-20	27.7	25.2	25.0	21.4	13.3
21-30	31.5	20.3	17.0	11.1	12.7
31-99	19.4	20.3	11.7	10.2	9.3

Table A-17

Armor Crewman's Job Knowledge Score by Time on Job for AFQT Groups

(Percent)

Months on Job	AFQT Level		
	0-20	21-30	31-99
1- 3	47.1	57.6	63.9
4- 9	44.4	49.2	58.6
10-15	54.9	57.6	67.9
16-24	56.4	54.1	67.4
25-60	59.2	64.7	70.3
61+	68.9	75.3	77.5

Table A-18

Repairman's Job Knowledge Score by Time on Job for AFQT Groups

(Percent)

Months on Job	AFQT Level		
	0-20	21-30	31-99
1- 3	35.1	34.7	41.5
4- 9	40.1	40.0	45.3
10-15	35.6	43.7	48.8
16-24	41.0	45.4	52.1
25-60	38.5	44.3	50.6
61+	55.6	57.7	63.9

Table A-19

Supplyman's Job Knowledge Score by Time on Job for AFQT Groups

(Percent)

Months on Job	AFQT Level		
	0-20	21-30	31-99
1- 3	42.0	39.0	49.5
4- 9	39.0	40.0	47.1
10-15	41.6	42.8	58.5
16-24	48.7	62.4	60.6
25-60	60.1	60.4	72.9
61+	81.0	78.6	78.6

Table A-20

Cook's Job Knowledge Score by Time on Job for AFQT Groups

(Percent)

Months on Job	AFQT Level		
	0-20	21-30	31-99
1- 3	37.8	43.0	50.5
4- 9	40.9	44.1	48.9
10-15	42.4	39.1	50.4
16-24	47.6	46.9	58.1
25-60	50.2	43.1	56.9
61+	57.9	65.6	68.6

Table A-21

Armor Crewman's Job Knowledge Score by AFQT for Time-on-Job Groups

(Percent)

Months on Job	AFQT Level				
	0-20	21-30	31-47	48-64	65-99
1- 9	45.2	52.4	59.3	57.0	65.4
10-24	55.8	56.2	63.1	67.0	71.9
25+	66.1	70.8	71.5	76.5	78.2

Table A-22

Repairman's Job Knowledge Score by AFQT for Time-on-Job Groups

(Percent)

Months on Job	AFQT Level				
	0-20	21-30	31-47	48-64	65-99
1- 9	38.2	37.8	39.8	44.1	47.9
10-24	38.8	39.0	46.8	45.5	53.3
25+	48.0	49.5	49.6	56.9	66.5

Table A-23

Supplyman's Job Knowledge Score by AFQT for Time-on-Job Groups

(Percent)

Months on Job	AFQT Level				
	0-20	21-30	31-47	48-64	65-99
1- 9	39.7	39.8	41.2	48.4	53.0
10-24	44.2	50.2	51.5	60.4	62.7
25+	65.7	69.3	74.5	76.9	76.5

Table A-24

Cook's Job Knowledge Score by AFQT for Time-on-Job Groups

(Percent)

Months on Job	AFQT Level				
	0-20	21-30	31-47	48-64	65-99
1- 9	39.7	43.7	46.5	49.8	53.9
10-24	45.7	44.4	49.5	55.4	63.1
25+	55.0	61.6	60.1	65.3	74.9

Table A-25

Distribution of AFQT Groups With 1 to 18 Months-on-Job on Job Knowledge Tests (Four MOSs Combined)

(Percent)

Quarter[a]	AFQT Level			
	0-20	21-30	31-64	65+
High	8.4	13.1	27.5	58.3
High Middle	20.2	26.4	32.0	21.0
Low Middle	30.2	28.2	25.6	10.8
Low	41.6	32.4	15.0	9.6

[a]In relation to performance on Job Knowledge Test.

Table A-26

Distribution of AFQT Groups With 19 to 30 Months-on-Job on Job Knowledge Tests (Four MOSs Combined)

(Percent)

Quarter[a]	AFQT Level			
	0-20	21-30	31-64	65+
High	26.6	32.6	65.2	83.5
High Middle	27.9	29.2	23.0	8.5
Low Middle	30.4	24.2	8.0	8.0
Low	15.1	14.0	3.8	0

[a]In relation to quarters of 1-18 MOJ subsample.

Table A-27

Distribution of AFQT Groups With 31+ Months-on-Job on Job Knowledge Tests (Four MOSs Combined)

(Percent)

Quarter[a]	AFQT Level			
	0-20	21-30	31-64	65+
High	56.1	79.3	85.0	100
High Middle	26.4	12.2	9.8	0
Low Middle	12.0	5.4	3.6	0
Low	5.5	3.1	1.6	0

[a]In relation to quarters of 1-18 MOJ subsample

Table A-28

Armor Crewman's Supervisor Questionnaire (Part II) by Time on Job for AFQT Groups

(Percent)

Months on Job	AFQT Level		
	0-20	21-30	31-99
1- 3	52.0	57.9	61.5
4- 9	58.9	58.3	63.4
10-15	58.6	58.6	60.9
16-24	55.1	54.4	54.9
25-60	59.1	73.0	70.0
61+	78.3	85.2	78.8

Table A-29

Repairman's Supervisor Questionnaire (Part II) by Time on Job for AFQT Groups

(Percent)

Months on Job	AFQT Level		
	0-20	21-30	31-99
1- 3	51.6	62.5	59.6
4- 9	61.3	57.7	61.9
10-15	55.7	62.3	67.7
16-24	52.2	50.4	63.1
25-60	68.0	67.9	71.1
61+	79.2	79.5	82.6

Table A-30

Supply Specialist's Supervisor Questionnaire (Part II) by Time on Job for AFQT Groups

(Percent)

Months on Job	AFQT Level		
	0-20	21-30	31-99
1- 3	55.8	51.8	71.2
4- 9	59.3	57.8	61.4
10-15	59.9	52.7	65.7
16-24	59.1	69.6	61.4
25-60	66.1	71.8	75.8
61+	73.9	84.3	73.2

Table A-31

Cook's Supervisor Questionnaire (Part II) by Time on Job for AFQT Groups

(Percent)

Months on Job	AFQT Level		
	0-20	21-30	31-99
1- 3	51.1	51.9	59.5
4- 9	56.0	57.7	59.3
10-15	62.3	40.0	57.3
16-24	59.0	50.4	63.6
25-60	50.1	50.6	69.9
61+	87.0	83.7	88.0

Table A-32

Armor Crewman's Questionnaire (Part II) Scores by AFQT for Months-on-Job Groups

(Percent)

Months on Job	AFQT Level				
	0-20	21-30	31-47	48-64	65-99
0- 9	56.7	58.1	65.2	58.5	64.9
10-24	56.5	56.9	62.2	51.8	58.8
25+	64.7	71.3	63.1	69.6	69.0

Table A-33

Repairman's Questionnaire (Part II) Scores by AFQT for Months-on-Job Groups

(Percent)

Months on Job	AFQT Level				
	0-20	21-30	31-47	48-64	65-99
1- 9	57.6	59.6	60.0	62.4	59.8
10-24	53.6	54.6	66.4	62.9	64.6
25+	65.5	64.4	66.8	66.7	71.9

Table A-34

Supply Specialist's Questionnaire (Part II) Scores by AFQT for Months-on-Job Groups

(Percent)

Months on Job	AFQT Level				
	0-20	21-30	31-47	48-64	65-99
1- 9	58.4	56.2	60.2	63.2	65.9
10-24	59.6	59.0	61.9	62.0	65.9
25+	60.7	69.6	69.5	70.6	59.2

Table A-35

Cook's Questionnaire (Part II) Scores by AFQT for Months-on-Job Groups

(Percent)

Months on Job	AFQT Level				
	0-20	21-30	31-47	48-64	65-99
1- 9	54.2	55.2	58.7	58.8	60.9
10-24	60.3	47.1	60.2	62.7	61.7
25+	65.1	68.6	76.6	72.3	78.0

Table A-36

Armor Crewman's Job Sample Subtests Arranged According to Difficulty

(Mean Percent Score for Categories I, III, and IV)

Test No.	Category IV	Non-Category IV
11	30.5	33.9
5	37.1	42.2
14	32.5	48.3
13	34.0	55.1
16	55.2	67.0
17	57.8	64.5
2	57.7	65.1
9	59.9	64.2
19	64.3	72.7
3	64.3	72.8
6	64.8	76.0
4	67.0	74.9
1	70.3	78.0
20	69.8	79.3
12	74.9	81.1
7	76.7	84.0
18	77.2	84.8
8	80.4	86.2
15	82.9	87.4
0	96.7	98.7

Table A-37

Repairman's Job Sample Subtests Arranged According to Difficulty

(Mean Percent Score for Categories I, III, and IV)

Test No.	Category IV	Non-Category IV
1	35.6	48.8
4	42.0	58.5
3	50.3	62.2
5	58.9	67.3
2	59.0	67.7
13	58.9	70.0
8	65.6	73.4
9	73.1	76.4
12	73.0	78.8
11	74.7	80.9
6	72.2	83.1
10	74.1	83.3
7	80.9	87.8

Table A-38

Supply Specialist's Job Sample Subtests Arranged According to Difficulty

(Mean Percent Score for Categories I, III, and IV)

Test No.	Category IV	Non-Category IV
7	43.1	51.8
5	47.0	55.8
6	49.7	61.3
8	50.2	60.8
1	56.6	66.6
2	63.0	72.4
3	72.4	80.8
4	84.2	85.8

Table A-39

Cook's Job Sample Subtests Arranged According to Difficulty

(Mean Percent Score for Categories I, III, and IV)

Test No.	Category IV	Non-Category IV
5	34.2	41.1
1	49.1	59.0
4	59.9	70.3
2	64.0	70.4
3	77.5	79.0

Table A-40

Armor Crewman's Performance on Easy, Medium, and Difficult Problem Subsets by Months-on-Job

(Percent)

Group	Months on Job				
	1-3	4-9	10-15	16-24	25+
Easy					
Category IV	75.1	64.3	81.8	88.7	90.7
Non-Category IV	75.9	77.1	89.8	90.0	94.6
Medium					
Category IV	38.3	40.9	62.8	75.1	82.5
Non-Category IV	58.1	51.0	80.2	77.8	85.8
Difficult					
Category IV	20.9	15.8	22.4	32.5	52.4
Non-Category IV	29.2	27.7	36.5	39.4	62.9

Table A-41

Repairman's Performance on Easy, Medium, and Difficult Problem Subsets by Months-on-Job

(Percent)

Group	Months on Job				
	1-3	4-9	10-15	16-24	25+
Easy					
Category IV	59.0	71.9	75.8	82.2	89.1
Non-Category IV	76.5	83.4	84.8	83.8	91.7
Medium					
Category IV	50.0	54.0	69.6	69.0	82.4
Non-Category IV	59.1	70.4	80.0	71.5	83.4
Difficult					
Category IV	34.7	37.0	37.1	42.6	65.6
Non-Category IV	44.2	53.5	54.5	60.2	70.6

Table A-42

Supply Specialists Performance on Easy, Medium, and Difficult Problem Subsets by Months-on-Job

(Percent)

Group	Months on Job				
	1-3	4-9	10-15	16-24	25+
Easy					
Category IV	64.0	65.8	63.0	72.2	76.6
Non-Category IV	72.0	69.7	72.2	75.4	78.4
Medium					
Category IV	53.8	49.4	49.0	56.1	64.6
Non-Category IV	56.9	59.0	66.5	67.8	73.8
Difficult					
Category IV	43.0	37.7	42.1	49.5	58.8
Non-Category IV	56.4	43.4	55.2	62.7	65.9

Table A-43

Cook's Performance on Easy, Medium, and Difficult Problem Subsets by Months-on-Job

(Percent)

Group	Months on Job				
	1-3	4-9	10-15	16-24	25+
Easy					
Category IV	71.3	76.1	78.6	83.9	84.6
Non-Category IV	79.9	76.1	80.7	79.6	84.5
Medium					
Category IV	55.5	56.2	59.2	56.5	71.9
Non-Category IV	64.9	62.7	71.7	71.3	79.6
Difficult					
Category IV	27.9	32.9	25.6	39.1	50.0
Non-Category IV	37.3	38.6	39.5	44.6	52.3

Table A-44

Armor Crewman's Job Sample Subtests Arranged According to Frequency of Performance

(Frequency Indices[a] for Category IVs and Non-Category IVs)

Test No.	Category IVs	Non-Category IVs
12	.46	.52
13	.54	.59
7	.83	.83
18	.91	.93
19	.91	.94
5	.92	.93
20	.88	1.01
16	.93	.98
17	.94	.97
14	.98	.96
15	.96	.99
2	.95	1.02
6	1.09	1.10
4	1.15	1.29
3	1.27	1.31
10	1.36	1.32
9	1.42	1.42
8	1.46	1.49
1	1.41	1.53
11	1.56	1.52

[a]Indices were computed by assigning weights of 0, 1, and 2, to the responses "never," "seldom," and "often," and obtaining mean subtest weights.

Table A-45

Repairman's Job Sample Subtests Arranged According to Frequency of Performance

(Frequency Indices[a] for Category IVs and Non-Category IVs)

Test No.	Category IVs	Non-Category IVs
4	.08	.04
5	.10	.07
1	.11	.07
3	.09	.10
2	.13	.10
12	.11	.17
10	.31	.31
8	.61	.65
7	.60	.71
9	.67	.69
13	.78	.79
6	.80	.91
11	.97	1.01

[a]Indices were computed by assigning weights of 0, 1, and 2, to the responses "never," "seldom," and "often," and obtaining mean subtest weights.

Table A-46

Supply Specialist's Job Sample Subtests Arranged According to Frequency of Performance

(Frequency Indices[a] for Category IVs and Non-Category IVs)

Test No.	Category IVs	Non-Category IVs
5	.56	.58
7	.59	.62
6	.53	.69
4	.63	.66
8	.65	.70
1	.79	.87
2	.88	1.00
3	1.30	1.38

[a]Indices were computed by assigning weights of 0, 1, and 2, to the responses "never," "seldom," and "often," and obtaining mean subtest weights.

Table A-47

Cook's Job Sample Subtests Arranged According to Frequency of Performance

(Frequency Indices[a] for Category IVs and Non-Category IVs)

Test No.	Category IVs	Non-Category IVs
4	.36	.40
2	.46	.55
5	.51	.75
1	.79	.84
3	1.48	1.51

[a]Indices were computed by assigning weights of 0, 1, and 2, to the responses "never," "seldom," and "often," and obtaining mean subtest weights.

Table A-48

Performance and Frequency on Subtests for Armor Crewmen in the Category IV Group

Subtest No.	Frequency Index	Performance Score (Percent)
12	0.5	74.9
13	0.5	34.0
7	0.8	76.7
20	0.8	69.8
19	0.9	64.3
18	0.9	77.2
5	0.9	37.1
16	0.9	55.2
17	0.9	57.8
2	1.0	57.7
15	1.0	82.9
14	1.0	32.5
6	1.1	64.8
4	1.2	67.0
3	1.3	64.3
10	1.4	96.7
9	1.4	59.9
8	1.5	80.4
1	1.5	70.3
11	1.6	30.5

Table A-49

Performance and Frequency on Subtests for Armor Crewmen in the Non-Category IV Group

Subtest No.	Frequency Index	Performance Score (Percent)
12	0.5	81.1
13	0.6	55.1
7	0.8	84.0
20	1.0	79.3
19	0.9	72.7
18	0.9	84.8
5	0.9	42.2
16	1.0	67.0
17	1.0	64.5
2	1.0	65.1
15	1.0	87.4
14	1.0	48.3
6	1.1	76.0
4	1.3	74.9
3	1.3	72.8
10	1.3	98.7
9	1.4	64.2
8	1.5	86.2
1	1.0	78.0
11	1.5	33.9

Table A-50

Performance and Frequency on Subtests for Repairmen Category IV Groups

Subtest No.	Frequency Index	Performance Score (Percent)
4	0.1	42.0
3	0.1	50.3
5	0.1	58.9
1	0.1	35.6
12	0.1	73.0
2	0.1	59.0
10	0.3	74.1
7	0.6	80.9
8	0.6	65.6
9	0.7	73.1
13	0.8	58.9
6	0.9	72.2
11	1.0	74.7

Table A-51

Performance and Frequency on Subtests for Repairman Non-Category IV Group

Subtest No.	Frequency Index	Performance Score (Percent)
4	0.0	58.4
1	0.1	48.8
5	0.1	67.1
3	0.1	62.2
2	0.1	67.8
12	0.2	78.8
10	0.3	83.3
8	0.6	73.4
9	0.7	76.4
7	0.7	87.8
13	0.8	70.0
6	0.9	83.1
11	1.0	80.9

Table A-52

Performance and Frequency on Subtests for Supply Specialists in the Category IV Group

Test No.	Performance Score (Percent)	Frequency Index
6	49.7	0.5
5	47.0	0.6
7	43.1	0.6
4	84.2	0.6
8	50.2	0.7
1	56.6	0.8
2	63.0	0.9
3	72.4	1.3

Table A-53

Performance and Frequency on Subtests for Supply Specialists in the Non-Category IV Group

Test No.	Performance Score (Percent)	Frequency Index
5	55.8	0.6
7	51.8	0.6
4	85.8	0.7
6	61.3	0.7
8	60.8	0.7
1	66.6	0.9
2	72.4	1.0
3	80.8	1.4

Table A-54

Performance and Frequency on Subtest for Cooks in the Category IV Group

Subtest No.	Performance Score (Percent)	Frequency Index
4	59.9	0.4
2	64.0	0.5
5	34.2	0.5
1	49.1	0.8
3	77.5	1.5

Table A-55

Performance and Frequency on Subtests for Cooks in the Non-Category IV Group

Subtest No.	Performance Score (Percent)	Frequency Index
4	70.3	0.4
2	70.4	0.6
1	59.0	0.8
5	41.1	0.8
3	79.0	1.5

Table A-56

Percent of Negroes and Caucasians at Five MOJ Periods

Months on Job	Negroes	Caucasians
0-15	17	83
16-24	19	81
25-36	28	72
37-72	32	68
73+	33	67

Table A-57

Percent of Negroes and Caucasians at Five AFQT Levels

AFQT Levels	Negroes	Caucasians
0-20	16	84
21-30	27	73
31-47	12	88
48-64	5	95
65-99	3	97

Appendix B

EXPLANATORY TABLES

Table B-1

Subtests Combined to Form Easy, Medium, and Difficult Subsets

Job Sample	Name of Subtest	Mean Job Sample Score (percent)
Armor Crewman		
Easy	Driving	97
	Loading Main Gun	85
	Identifying Driver Control	83
	Powering Turret, Checking Azimuth Indicator	81
Medium	Assembly, Disassembly .50MG	71
	Arranging Tank Models in Combat Formations	70
	Adjustment of Fire	68
	Assembly, Disassembly of Coaxial MG	68
Difficult	End-for-End Test—Gunners Quadrant Zeroing Elevation Quadrant	45
	Arm, Hand, Flag, and Light Signals	40
	Preparation of Range Card	40
	Before Operations Maintenance	32
Repairman		
Easy	Ignition Adjustment	84
	Battery Condition Test	79
	Wheelbearing Malfunction	78
	Ignition Malfunction	78
Medium	Hydrometer Test	75
	Compression Check	70
	Brake Bleeding	64
Difficult	Linkage Adjustment	42
	Brake Adjustment	50
	Rheostat Adjustment	56
Supply Specialist		
Easy	Sorting for Fair Wear and Tear	85
	Hand Receipt	71
Medium	Laundry Roster	62
	Documentation of Request	56
Difficult	Request for Issue	47
	Request for Maintenance	51
Cooks		
Easy	Scrambled Eggs	78
Medium	Lighting M1937 Fire Unit	54
	Cocoa	67
	Jelly Roll	65
Difficult	Cook's Work Sheet	38

Table B-2

Incidence of Categorized Items

Step	Armor Crewman	Repairman		Supply Specialist		Cook
		Without Manual	With Manual	Without Manual	With Manual	
N	3	4	58	46	78	62
NK_2	93	9	50	54	52	10
NK_2S	8		8			
NK_2I		1	1	1	2	
NS			3			25
NI		1	1			
K_1	22	45	20	11	6	21
K_1K_2	185	98	30	35	10	20
$K_1K_2K_3$	39	12	1			
K_1K_2S	4		1			
K_1K_2I		4	1	2	1	10
K_1K_3	5					
K_1I		1	1			1
Total[a]	359	175	175	149	149	149

[a]For all but the Armor Crewman, the number of steps categorized is slightly less than the total number of steps in the Job Sample Test. These omissions occurred largely where a step could not be reliably categorized.

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13. ABSTRACT

To provide information on performance and characteristics of effective and ineffective marginal personnel in the Army, a study has been made of approximately 1500 men with experience ranging up to 20 years in four different Army MOSs. The study included a group of men with Armed Forces Qualification Test scores in the marginal range and a comparison group of men in the same jobs, but in the upper AFQT levels. This report, the third in a series, describes the bulk of the major study findings including comparisons of the performance of men in different mental categories with different amounts of job experience, comparisons of the performance of special subgroups (Negroes and Caucasians, inductees and enlistees, and men with formal and on-the-job training), an analysis and definition of acceptable performance, and a procedure for using Job Knowledge tests to screen ineffective performers.

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
*Aptitudes						
*Army Personnel						
*Enlisted Personnel						
*Experience						
*Job Analysis						
*Performance Evaluation						
*Personnel						
*Personnel Selection						
*Specialized Training						
*Transfer of Training						
Aptitude Tests						
Armed Forces Qualification Test Scores						
Job Knowledge Tests						
Marginal Personnel						
MOS Performance						
Test Administration						
Test Development						

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10 CG USA FORCES SOUTHERN COMD ATTN SCAPCO CZ
2 CG US ARMY EUROPE APO 09403 NY ATTN OPNS DIV
1 CG USA AD COMD FNT AFP ATTN ADCPA COL J
6 CG 1ST ARMY ATTN DCSOT FT MEADE MD
1 CG 3RD ARMY ATTN DCSOT FT MCPHERSON
4 CG SIXTH ARMY PRES OF SAN FRAN ATTN AMOPS-E2
1 DIR HEL APG MD
1 CG USA CDC EXPERIMENTATION COMD FT ORD
2 ENGNR PSYCHOL LAB PIONEERING RES DIV ARMY NATICK LABS NATICK MASS
4 TECH LIB ARMY NATICK LABS NATICK MASS
2 INST OF LAND CRT ATTN TECH LIB FT BELVOIR VA
1 REDSTONE SCIENTIFIC INFO CTR US ARMY MSL COMD ATTN CHF DOC SEC ALA
1 CO FT HUACHUCA SPT COMD USA ATTN TECH REF LIB
1 SIXTH USA LIB DEPOT BLDG # 13 14 PRES OF SAN FRAN
1 PLNS OFCR PSYCH HQTRES USACDCEC FT ORD
1 DIR WALTER REED ARMY INST OF RES WALTER REED ARMY MED CTR
1 DIR WRAIR WALTER REED ARMY MED CTR ATTN NEUROPSYCHIAT DIV
1 CO HQ ARMY ENLISTED EVAL CTR FT BENJ HARRISON
1 TECH LIB BOX 22 USACDC EXPERIMENTATION COMD FT ORD
1 CO FRANKFORD ARSNL ATTN SMUFA-N6430/232-4 PA
1 4TH ARMY MSL COMD AIR TRANSPORTABLE SAN FRAN
1 REF # MS IS NASA ALA
1 CO USA CBT DEVEL COMD TRANS AGCY FT EUSTIS
1 CO ARMY CDC ARMOR AGY FT KNOX
1 CO US ARMY CDC AVN AGCY FT RUCKER
1 CG USA TNG CTR & FT LEONARD WOOD ATTN ACOFS G3
1 CG USA INF CTR ATTN AJIGT-T FT BENNING
1 CG USA TNG CTR INF ATTN ACOFS G3 FT DIX
1 CG USA TNG CTR ATTN ACOFS G3 FT JACKSON
1 CG USA TNG CTR INF ATTN ACOFS G3 FT LEWIS
1 CG USA TNG CTR INF & FT ORD ATTN ACOFS G3
61 CG USA TNG CTR INF ATTN ACOFS G3 FT POLK
20 CG USA AD CTR ATTN G3 FT BLISS
1 CG USA TNG CTR INF ATTN ACOFS G3 FT CAMPBELL
3 LIB ARMY WAR COLL CARLISLE 3K5
1 US MILIT ACAD WEST POINT ATTN LIB
1 COMDT ARMY AVN SCH ATTN DIR OF INSTR FT RUCKER
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1 COMDT USAIS ATTN AJIIS-D-FPAD FT BENNING
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1 COMDT USA AD SCH ATTN DOI FT BLISS
5 ASST COMDT ARMY AIR DEF SCH FT BLISS ATTN CLASSF TECH LIB
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1 OPTY ASST COMDT USA AVN SCH ELEMENT GA
1 USA AVN SCH ELEMENT OFC OF DIR OF INSTR ATTN EDUC ADV GA
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1 CO USA INTELL CTR & SCH ATTN DIR OF D C & LIT FT HUACHUCA
1 COMDT USA CRGSC OFC OF CHF OF RESIDENT INSTR FT LEAVENWORTH
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1 COMDT USA CA SCH ATTN DOI FT BRAGG
1 COMDT USA CA SCH ATTN EDUC ADV FT BRAGG
1 COMDT USA CA SCH ATTN LIB FT BRAGG
1 COMDT USA SCH & TNG CTR ATTN ACOFS G3 TNG DIV FT MCCLELLAN
1 COMDT USA SCH & TNG CTR ATTN ACOFS G3 PLNS & OPS DIV FT MCCLELLAN
10 COMDT USA INST FOR MIL ASSIST ATTN DOI FT BRAGG
1 LIBY USAIS FT BENNING
8 COMDT USA FLD ARTY SCH ATTN DOI FT SILL
1 COMDT USA ARTY SCH ATTN EDUC SERVICES DIV FT SILL
1 COMDT USA ARTY SCH ATTN EDUC ADV FT SILL
1 COMDT USA TRANS SCH ATTN LIB FT EUSTIS
1 USA INST FOR MIL ASST ATTN EDUC ADV FT BRAGG
1 COMDT USA ARTY SCH ATTN LIB FT SILL
1 CG USA SCH & TNG CTR ATTN ACOFS G3 FT GORDON
1 DIR OF GRAD STUD & RSCH ATTN BEHAV SCI REP USACGSC
1 COMDT USA AD SCH ATTN AKBAS-DL-EA FT BLISS
2 DIR RRGD + 9N OPNS DEPT USAIS FT BENNING
1 DIR COMM ELEC USAIS FT BENNING
1 DIR ARM-AIR MOBILITY DEPT USAIS FT BENNING
1 CG USA SIG CTR & SCH ATTN ATSSC-OP-COB FT MONMOUTH
1 SECY OF ARMY, PENTAGON
1 DCS-PERS DA ATTN CHF C+S DIV
1 DIR OF PERS STUDIES & RSCH ODCSPER DA WASH DC

2 ACSFOR DA ATTN CHF TNG DIV WASH DC
1 CG USA MAT COMD ATTN AMCRD-TF
1 US ARMY BEHAVIOR & SYS RSCH LAB ATTN(PERI)-AR ARL VA
1 PROVOST MARSHAL GEN DA
1 DEC RESERVE COMPON DA
12 ADMIN OOC ATTN: TCA (HEALY) CAMERON STA ALEX., VA. 22314
1 CO US ARMY MED RES LAB FT KNOX
1 CHF OF R+D DA ATTN CHF TECH + INDSTR LIAISON OFC
1 CO USA CDC MED SERV AGCY FT SAM HOUSTON
1 USA BEHAVIOR & SYS RSCH LAB ATTN C+D-AIC ARL VA
1 CAREER MGT BR ATTN R DEFENSE CAMERON STA ALEX VA
1 USA LIB DIV-TAGO ATTN ASDIRS
1 PRES ARMY MAINT BD FT KNOX
1 CG CONARC ATTN COL E M HUDAK ATIT-SA FT MONROE
15 CG CONARC ATTN SCIT-STM FT MONROE
2 CG CONARC ATTN LIB FT MONROE
1 USA ARCTIC TEST CTR CHF INSTR & TEST 4ETH DIV SEATTLE
1 CHF USA AD HRU FT BLISS
1 CHF USA ARMOR HRU FT KNOX
1 CHF USA AVN HRU FT RUCKER
1 CHF USA INF HRU FT BENNING
1 CHF USA TNG CTR HRU PRES OF MONTEREY
3 CG ARMY ARMOR CTR FT KNOX ATTN G3 AIRBST
1 CG 3RD INF DIV ATTN ACOFS G3 APO NY 09036
1 CG 7TH INF DIV ATT ACOFS G2 APO SAN FRAN 96207
3 CG 4TH INF DIV (MECH) & FT CARSON ATTN ACOFS G3
1 DA HQS FT CARSON & HQS 4TH INF DIV (MECH) ATT MAJ HARRIS
3 CG 82ND AAN INF DIV ATTN ACOFS G3 FT BRAGG
1 CG XVIII ARN CORPS ATTN ACOFS G3 FT BRAGG
1 CO 197TH INF BRGD FT BENNING ATTN S3
1 CO 2ND BN 15TH INF 3RD INF DIV ATTN S3 APO NY 09034
1 CO 4TH BN (MECH) 54TH INF ATTN S3 FT KNOX
2 DA OFC OF ASST CHF OF STAFF FOR COMM-ELCT ATTN CETS-A ASH
1 USA RECRUITING COMD HAMPTON VA
1 DIR ARMY LIB PENTAGON
1 CHF OF MILIT HIST DA ATTN GEN REF &R
1 CO USA 10TH SPEC FORCES GP FT DEVENS
1 CG 31ST ARTY BDE AD ATTN S3 PA
1 CG 101ST ABN DIV (AIRMOBILE) ATTN ACOFS G3 APO SAN FRAN 96383
1 CG 1ST CAV (AIRMOBILE) ATTN ACOFS G3 APO SAN FRAN 96383
1 US ARMY TROPIC TEST CTR PO DRAWER 942 ATTN BEHAV SCIEN OF
10 CG III CORPS & FT HOOD ATTN G3 SEC FT HOOD
30 CO 1ST ARMORED DIV ATTN G3 SEC FT HOOD
30 CG 2D ARMORED DIV ATTN G3 SEC FT HOOD
25 CO 13TH SUPT BDE ATTN S3 SEC FT HOOD
1 CG USAFAC & FT SILL ATTN AKPSIGT-TNTN
20 CO III CORPS ARTY ATTN G3 SEC FT SILL
15 CO 1ST AIR MOBE ATTN G3 SEC FT BLISS
1 RSCH CONTRACTS & GRANTS RR ARO
1 RESJ ARO DEC CHF OF RED WASH DC
1 CHF OF RED DA ATTN SCI INFO PR RSCH SPT DIV WASH DC
1 CINC US ATLANTIC FLT CODE 312A USN BASE NORFOLK
1 COR TNG COMMAND US PACIFIC FLT SAN DIEGO
3 DIR PERS RES DIV BUR OF NAV PERS
1 TECH LIB BUR OF SHIPS CODE 210L NAVY DEPT
1 CO FLT ANTI-AIR WARFARE TNG SAN DIEGO
1 CO NUCLEAR WPNS TNG CTR PACIFIC US NAV AIR STA SAN DIEGO
1 CO FLEET TNG CTR US NAV STA SAN DIEGO
1 CO FLT ANTI-SUB WARFARE SCH SAN DIEGO
1 CHF OF NAVL RSCH PERS & TNG PR (CODE 458) ARL VA
1 DIR US NAV RES LAB ATTN CODE 5120
1 DIR NAVAL RSCH LAB ATTN LIB CODE 2029 WASH DC
1 CO MED FLD RES LAB CAMP LEJEUNE
1 DIR AEROSPACE CREW EQUIP LAB NAV AIR ENGNR CTR PA
4 COMDT MARINE CORPS HQ MARINE CORPS ATTN CODE AO-1B
1 HQ MARINE CORPS ATTN AX
1 DIR MARINE CORPS INST ATTN EVAL UNIT
1 US MARINE CORPS HQS HIST REF LIB ATTN MAS JAGOT
1 CHF OF NAV AIR TECH TNG NAV AIR STA MEMPHIS
1 DIR OPS EVAL SRP OFC OF CHF OF NAV OPS OP07EG
1 CO US COAST GUARD TNG CTR GOVERNORS ISLAND NY
1 CO US COAST GUARD TNG CTR CAPE MAY NJ
1 CO US COAST GUARD TNG CTR & SUP CTR ALAMEDA CALIF
1 CO US COAST GUARD INST OKLA CITY OKLA
1 CG US COAST GUARD RES TNG CTR YORKTOWN VA
1 SUPT US COAST GUARD ACAD NEW LONDON CTNN
1 TECH DIR TECH TNG DIV(HPO) AFHRL LOWRY AFB COLO
1 CHF SCI DIV ORCTE SCI + TECH DCS R+D HQ AIR FORCE AFRSTA
1 AFHRL/ZT ATTN CAPT W S SELLMAN LOWRY AFB
1 HQ SAMSO (SMSIR) AF UNIT POST OFC LA AFS CALIF
2 AFHRL (HRT) WRIGHT-PATTERSON AFB
1 AMD AWRM BROOKS AFB TEXAS
2 CO HUMAN RESOURCES LAB BROOKS AFB
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1 GEN H P HARRIS (USA RET)PRES THE CITADEL SC
1 DR H SHOEMAKER DIR ING RSCH GP NY
1 VOC-TECH EDUC PROG PLNNG DEV ATTN W STOCK ST PAUL
1 CHE PROCESSING DIV DUKE U LIB
1 U OF CALIF GEN LIB DOCU DEPT
1 PSYCHOL LIB HARVARD UNIV CAMBRIDGE
1 U OF ILL LIB SER DEPT
2 U OF KANSAS LIB PERIODICAL DEPT
1 U OF NEBRASKA LIBS ACQ DEPT

1 OHIO STATE U LIBS GIFT + EXCH DIV
1 PENNA STATE U PATTEE LIB DOCU DESK
1 PURDUE U LIBS PERIODICALS CHECKING FILES
1 STANFORD U LIBS DOCU LIB
1 LIBN U OF TEXAS
1 SYRACUSE U LIB SER DIV
1 SERIALS REC UNIV OF MINN MINNEAPOLIS
1 STATE U OF IOWA LIBS SER ACQ
1 NO CAROLINA STATE COLL DH HILL LIB
2 BOSTON U LIBS ACQ-DIV
1 U OF MICH LIBS SER DIV
1 BROWN U LIB
1 COLUMBIA U LIBS DOCU ACQ
1 DIR JOINT U LIBS NASHVILLE
2 LIB GEO WASH UNIV ATTN SPEC COLL DEPT WASH DC
2 LIB OF CONGRESS CHF OF EXCH + GIFT DIV
1 U OF PGH DOCU LIBN
1 CATHOLIC U LIB EDUC & PSYCHOL LIB WASH DC
1 U OF KY MARGARET I KING LIB
1 SO ILL U ATTN LIBN SER DEPT
1 BRIGHAM YOUNG U LIB SER SECT
1 U OF LOUISVILLE LIB BELKNAP CAMPUS
1 GEORGETOWN U LIB SER DEPT WASH DC
1 LIBS COLO STATE U ATTN DOC LIBN FT COLLINS
1 CLIN PSYCHOL SERV DEPT OF NEUROPSYCH IAT WALTER REED GEN HOSP
1 CO DEF DEV ENGR LAB ATTN LIBN EDGEWOOD ARSNL MD
1 CO USA COC CRR AGCY FT MCCLELLAN ALA
1 CG ARMY ELEC RVG GD ATTN TECH LIB FTHUACHUCA ARIZ
1 CHF DEPT OF CLIN & SOC PSYCH WRAIR WASH DC
1 CO DUGWAY PVG GD ATTN TECH LIB UTAH
1 CO USA MOBILITY EQUIP R&D CTR ATTN TECH DOC CTR FT BELVOIR
1 CG 2ND RGN ARADCOM RICHARDS-GEBAUR AFB MO
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1 RADC RASH GRIFFISS AFB NY
1 ATC ATXRQ RANDOLPH AFB
1 DIR RAND CORP ATTN LIB WASH DC
1 CRESS-AIR ATTN LIBN MD
1 BATTELE MEMORIAL INST ATTN RACIC COLUMBUS GA
1 CO USN SCH OF AVN MED USN AVN MED CTR FLA
1 CO & DIR USN ELECT LAB ATTN LIB SAN DIEGO
1 SMAMA (SMACU-PRSNL RSCH) MCCLELLAN AFB CALIF
1 COMD ELECT SYS DIV ATTN ESTI BEDFORD MASS
1 GP EFFECTIVENESS RSCH LAB U OF ILL DEPT OF PSYCHOL
1 AVCO CORP AVCO MSL DIV ATTN RSCH LIB DETROIT
1 1 EACH USA TNG CTR
1 US DEPT OF LABOR
1 US GOVT OEO WASH DC

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